

雅思

机经题源大全

阅读 科学分册

IELTS

READING

丛书主编 / 北京外国语大学 江涛

本书主编 / 江涛 孟飞

审订 / Eve Bower Mathew G. Gower Niall McDonagh

石油工业出版社





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《江涛英语》系列丛书编委会

《雅思机经题源大全》系列丛书编委会



前 言

《雅思机经题源大全 阅读 科学分册》以历年雅思真题为基础，以真题机经版本回顾为依据，再现原汁原味的国外原版材料，覆盖真实考试内容。本书从国外权威期刊、杂志及学术论文集锦中精选与历次雅思阅读真题文章最为相符、甚至相同的100篇文章，按照雅思阅读常考科学类话题进行分类整理，分为生物科学类、建筑科学类、医疗健康类、自然环境类、其他，共5个单元。入选文章无论从内容上还是难易程度上都力求贴近雅思阅读考试。通过阅读本书，考生不仅可以在阅读能力和技巧上得到提高，还能增强读者对西方社会、文化以及科技进展的知识储备，有助于拓宽思路，以便更好地应对雅思阅读考试。

为了帮助考生更好地运用本书精选的文章资料，本书特设以下栏目：

机经选粹：结合雅思培训教师平日的授课积累，汇总“机经”对雅思阅读真题文章的描述，为考生再现雅思阅读真题文章的原貌轮廓。

阅读题源：标明入选文章的来源，便于考生平日复习时有侧重地选择辅助阅读资料。

雅思档案：依照入选文章与雅思阅读真题文章的匹配程度和文章自身内容的精彩程度注明推荐程度，并按照由近到远的原则罗列对应雅思真题阅读文章的具体考核时间，帮助考生做到知己知彼，百战不殆。

题源全文：再现与历次雅思阅读真题文章匹配度极高、甚至完全匹配的文章。对于过长的文章，用正体字标注与雅思阅读真题文章关联最密切的主体部分，用斜体字标注细节信息。

参考译文：针对“题源全文”的主体部分（即正体字部分），给出精准的中文翻译，便于考生更好地理解选文。对于长度在1,000词左右的选文，全文翻译；长度超过1,000词的选文，节选出1,000词左右的重点部分（正体字部分），进行翻译。

核心词汇：对选文中难点单词或重点单词进行标注，给出音标、文中词性及词义。

预祝所有雅思考生应试成功！

编 者

2009年6月



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第一章

生物科学类

The Search for Life

1. 探索生命

机经选粹

这篇文章讲述的是人们对火星是否有生命存在的探索过程。一开始说到人类满怀希望地探索火星，用探测器探测却发现火星荒芜的面貌时，人们的看法全然改变。后来说到在地球的南极洲发现了一块来自火星的陨石，用显微镜能看见生物化石，还有其他一些生命迹象。这一发现，也就是说火星上曾经有水的痕迹，又让人们重燃了探索火星是否有水的兴趣。



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题源全文

The Search for Life

If all goes well, Polar Lander will search the Red Planet this week for clues that Mars once had abundant water and therefore, just maybe, life. The finds may help solve an ancient mystery: are we alone?

The table in Sarah Gavit's compact, sunny office at the Jet Propulsion Laboratory in Pasadena, Calif., is strewn with a dozen bruised and battered hunks of metal, most of them shaped like big bullets. You're looking at a museum here, she says—a museum of one of the more audacious space experiments ever: two probes that will burrow into the surface of Mars at 400 miles per hour and sniff out hints of whether the planet could once have supported life. To design the contraptions, Gavit, already a veteran of unmanned missions to Venus and Saturn, began designing and testing prototypes in 1995. We threw them out of Cessnas over the Mojave Desert at 10,000 feet, she recalls. We ended up losing quite a few. Very hard to find these things. Then, when she needed more speed, she rented an air gun. Wearing hard hats and crouching in bunkers before every shot, Gavit and her team figured out which aeroshell shape could protect the instruments inside from a force of 60,000 G's. And this week, if Gavit's luck holds, two acorn-shape aeroshells will scream across the Martian sky and will each release a tiny probe that will punch into the soil like a meat thermometer into last week's turkey.

The stakes are somewhat higher than finding if a drumstick is cooked through, though slow roasting is on the Martian agenda. A little corkscrew like drill will

pop out of the four-inch probes, dig in, grab some soil and drop it into a tiny chamber to be cooked and analyzed. Gavit, hunched over her console at JPL, will be scrutinizing the data stream for hints of water ice, a sign that once, long ago, life might have gained a toehold on our sister planet. And if there is frozen water, there may be liquid water deep underground. It may be reasonably warm under the surface of Mars, says Scott Hubbard, who heads NASA's new Institute of Astrobiology. If there's still liquid water underground, like the ancient aquifers under Phoenix, then life could still, possibly, exist on Mars. That's a respected speculation within the scientific community.

It is spring in the southern hemisphere of Mars, and the south polar icecap is retreating like frost on a sun-drenched window. Just as the season stands for the renewal of life on Earth, so a number of scientists are hoping that the Martian spring will bring clues to the existence of life, past or present, on the Red Planet. Late this week, if all goes well, the $165 million Mars Polar Lander will touch down on Earth's closest neighbor after an 11-month journey. At 1,400 miles up, it will release Gavit's aeroshells, which it has been carrying on its exterior, like canteens strapped to a hiker's belt. Then it will parachute down to a landing target about 480 miles from the planet's south pole. This is where the carbon dioxide icecap advances and retreats with the seasons (as of Nov. 5, the edge of dry ice had just shrunk back from the landing site). It is also what scientists call a cold trap: a region where volatile compounds in the Martian atmosphere, after blowing around the planet, finally fall to ground. There are a lot of cool places to explore on Mars, but if you're looking for water and ice, the compound associated with life, then the place you want to be is the place where it got stuck, says David Paige of UCLA, the principal investigator for the mission's main experiments.

The question of life on Mars has a long pedigree. Ever since the late 1870s, when Italian astronomer Giovanni Schiaparelli reported seeing"canali", or channels, on Mars, the planet has offered hints that humankind might not be alone. A few years later, American businessman Percival Lowell made telescope observations that convinced him the canals (a mistranslation) were built by an alien civilization. Visionaries dreamed of transmitting messages to Mars with huge mirrors. In 1922 and 1924, the U.S. government asked radio stations to go quiet for a while so radio operators could listen for signals from Mars, which was making two of its closest passages to Earth. Needless to say, no one picked up any cosmic hellos. And images returned from spacecraft orbiting or flying by Mars in the 1960s showed a desolate world, pockmarked with craters, with nary a canal-building crew in sight. Experiments by the Viking landers in 1976, which searched for chemical signs of life, were widely interpreted as a down-arrow for little green men, and even tiny brown microbes. But then came the summer of 1996. After alerting the White House, a team from NASA's Johnson Space Center and Stanford University announced that a hunk of rock from Mars, which had been blasted off the planet by asteroid or meteor impacts 17 million years ago and landed in Antarctica, contained microscopic fossils and other signs

of life. That claim has been hotly disputed (sidebar). But it pushed NASA to declare the search for evidence of past or present life the first of the highest priority scientific objectives for its Mars missions—and to throw $50 million more a year into the effort.

What makes Mars hospitable to life is the presence of liquid water billions of years ago. Earlier missions discovered canyons and deep outflow channels that wind hundreds or thousands of miles downhill to the northern plains. They seem to have been formed by running water—lots of running water: some features look like they were carved by torrents raging with a force of 10,000 Mississippi Rivers. But more recent observations go further. Images taken by the Mars Orbiter Camera spied a 500-mile-long channel. Named Nanedi Vallis, its sinuous shape... suggests that the river that cut the valley was fed largely by groundwater, says geologist Michael Carr of the U.S. Geological Survey. If so, then liquid water may still exist deep below the surface of Mars, even though the planet today is too cold and the atmosphere too thin to keep water liquid at the surface. (In such thin air, water boils instantly.) Liquid water is necessary, though not sufficient, for life.

Now the signs of water on Mars have grown even more tantalizing. The outflow channels do not continue far into the northern highlands, points out geologist James Head of Brown University. They disappear really quickly. Where did the water go? Ten years ago scientists led by Timothy Parker of JPL scrutinized some of the old photos of Mars and thought they spied long, curving lines in the northern lowlands. Now Head and colleagues are presenting findings from the altimeter on the Mars Global Surveyor (which is orbiting the planet) that suggest at least one of the marks may be an ancient shoreline. For one thing, the line stays at a near-constant elevation, which is what you'd expect of a shoreline (sea level is sea level on Earth, after all). Also, the lowlands that the line curves around are extraordinarily flat and smooth. One way such terrain forms is that sediments that have washed into a sea fall out, says Head, just as they did to form the floors of the deepest seas on Earth. Standing water would provide a source of water vapor, through evaporation, notes Head. Water vapor absorbs heat, and so would have warmed the atmosphere on ancient Mars from its current frigidity into a toastier range.

For years the party line on Martians has been that the environment is too hostile for them: it 's cold and it 's dry, and the thin atmosphere is no more effective against damaging solar radiation than a paper umbrella against hail. But standing water blocks solar radiation. And those shorelines are also interesting. For biology to emerge from mere chemistry, you need the basic ingredients of life (compounds like nucleic acids and proteins), water to mix them all together and an energy source to zap them with that vital spark. The heat of hydrothermal vents might do the trick. So might lightning. *But so might something as gentle, and as simple, as waves lapping on an ancient shore. The ebb and flow of tides could also have provided the alternating wet-and-dry conditions that some theories of life's origins say transform not-quite-*

biological molecules into fully biological ones. If Mars did sustain a great northern ocean, says Head, then there would have been tens of millions of years of an environment compatible with what we know about the origins of life. Or, as planetary scientist William Boynton of the University of Arizona puts it, If life didn 't get started on Mars, we 'd really have to wonder why not.

The standing water is long gone, of course: the Noachian period on Mars ended at least a billion years ago, maybe two. With no liquid water on the surface, the planet would be hard pressed to sustain life. Or so it seemed. We have broadened our thinking about when and where life might occur because we have found [microbes] living in complete darkness in thermal vents, and inside rocks in the dry valleys of Antarctica eating hydrogen, says Hubbard. Other newly discovered extremophiles on Earth sustain life by dissolving minerals—they eat rocks. Others live in sulfuric acid, at 212 degrees Fahrenheit, or in environments as acidic as vinegar or as harsh as ammonia. Apparently, life is pretty loose about where it lives. If life ever got started on Mars, says James Head, then I'd say you'd have a helluva time eradicating it. Once the surface became inhospitable, life would go underground.

That possibility has re-energized the quest for life on Mars. Although life there might not be so abundant as to require reclassifying My Favorite Martian as a documentary, it may be holding on in niches deep below the cold, arid eolian surface. Experiments on Mars Polar Lander during the planned 90-day mission will seek out signs of conditions conducive to life. As the probes, named after (Earth 's) South Pole explorers Amundsen and Scott, search for water and water ice about 60 miles to the north, the lander will cook up its own experiments. A 6-foot-6 robotic arm, resembling a shiny steel backhoe, will scoop up minuscule soil samples, putting thousandth-of-an-ounce dollops into the $4.4 million Thermal and Evolved Gas Analyzer. TEGA 's eight tiny ceramic ovens, each as big as a piece of elbow macaroni, will heat the samples. As gases are released, they will waft into an adjoining chamber where lasers will determine the concentrations of water, carbon dioxide and water-bearing minerals in the Martian soil. Depending on how much heat was required to drive off the water, the scientists will be able to infer whether the water was present as plain old ice, in carbonates (like limestone), or in hydrates. These minerals form almost nowhere but in water, and so would suggest ancient seas. Although Polar Lander isn 't designed to look for life itself, scientists was eloquent about what it would mean if a future mission detected signs of ancient or extant life. About how the discovery might shed light on how life emerged from nonlife on Earth. About how it might show whether there is more than one way to build life—do Martians have DNA? About how it might show the way an abrupt environmental change makes life fizzle out—or at least stop evolving beyond primordial ooze. But the deeper implications might come from a discovery that Mars never supported life. For that would challenge scientists to identify what vital spark was missing in a place that seemed to have all the right ingredients, and challenge the rest of us to see the single known example of life in the universe as that much more wondrous.

But first, the Polar Lander must elude the Martian jinx. The Russians lost several Mars missions in the 1960s and their Mars 3, the first spacecraft to land on the Red Planet, went silent seconds after touchdown. JPL engineers joked that a great galactic ghoul was gobbling up Mars probes, but it was no laughing matter when their $1 billion Mars Observer went AWOL in 1993. And this past September, Polar Lander's companion, the Climate Orbiter, performed a flight maneuver that had been calculated in pound-seconds (a British unit), rather than newton-seconds (metric). As a result, the $125 million spacecraft tried to enter Martian orbit at an altitude of 34 miles rather than the planned 135. It either crashed or skipped off into space. During the investigation, an engineer discovered that Polar Lander was wending its way through 137 million miles of space with its own potentially fatal flaw: fuel lines on the descent engine are at risk of freezing. If they do, the craft will crash, but JPL director Edward Stone assures that controllers will turn on the [engine's] heaters earlier.

If Polar Lander survives and sends back data that strengthen the case for ancient life on Mars, enthusiasts hope.it will give a boost to dreams of sending humans there. Says Robert Zubrin, founder of Pioneer Astronautics, The human presence—whether to drill for signs of life in liquid water deep underground or to look for fossils—becomes increasingly important. Zubrin envisions a series of paired launches, in which one spacecraft of each pair would deposit an Earth-return vehicle on Mars and the other, up to three months later, would send a crew of four, a habitat module and a duplicate return vehicle. After a six-month flight and an 18-month sojourn on Mars, the crew would return home in the first vehicle, using fuel that it had made from Mars's carbon-dioxide atmosphere (carbon dioxide reacts with hydrogen, which the ship would bring from Earth, to produce methane fuel). NASA administrator Daniel Goldin has said that, within a few years, he would like to present to the (next) president a blueprint for sending astronauts to Mars. Zubrin hopes for an announcement even sooner. A new millennium and a new administration is the time for great beginnings, he says. No group of nations has ever been better equipped to launch a new age of exploration.

Still, a program that loses robotic Mars missions will not be entrusted with human lives until it can show that it can get them there and back safely. And that requires assurances that if life once did, or still does, exist on Mars it poses no threat to astronauts. That may become clearer in 2008, when a mission brings samples of Martian dirt and rock back to Earth for analysis. There may have been similar exports in the past: some scientists suspect that if life arose on Mars, it might have seeded Earth with primitive microbes. Mars, having a weaker gravitational field than Earth's, tends to lose whole chunks of itself when bombarded by comets or asteroids. If its primordial life rode a meteorite to Earth, then we have already discovered Martian life: the descendants of that ancient interplanetary vagabond would be... us.





火星上曾经拥有丰富的水资源，因此，那里也许还会存在生命。如果一切进展顺利，火星极地登陆者号这周将前往火星探测与此相关的一些线索。探索结果也许会有助于我们解开那个古老的谜团：地球是宇宙中唯一存在生命的星球吗？

人们对火星上是否有生命存在这一问题的探索历史久远。19世纪70年代末，意大利天文学家乔瓦尼·夏帕雷里宣称他在火星表面发现了线条结构也可能是水道。那时候火星就向人们暗示了人类可能并不是宇宙中唯一存在的生物。几年后，美国商人帕西瓦尔·罗威尔用望远镜进行观察，并由此确信那些“运河”(误译)是外星人建造的。一些空想家梦想着用一面面巨大的镜子向火星传递信息。1922年和1924年，当火星两次距离地球最近时，美国政府让所有广播电台都暂停片刻，以便那些无线电报务员收听来自火星的信号。不用说，没有一个人收到任何来自宇宙的问候。20世纪60年代，绕火星轨道运行或飞过火星上空的宇宙飞船向地球发回了一些图像。从图像上看，那里是一个荒芜的世界，到处布满了凹陷的火山口，连一个修建运河的人的影子都没有。1976年发射的海盗号火星登陆器进行了一些实验，以寻找有关生命的化学迹象。人们普遍认为这些实验是为了寻找绿色小矮人(即外星人)，甚至是棕色微生物。后来到1996年夏季，来自美国国家航空航天局约翰逊空间中心和斯坦福大学的一组科学家们在预先通知白宫后又将这一发现公之于众：1700万年前，由于小行星或流星与火星相撞引起了一场爆炸，火星上一大块岩石在爆炸中飞离火星表面并落在了南极洲。该岩石中含有用显微镜能看见的生物化石，还有其他一些生命迹象。这一发现的公布引发了人们的激烈争论(花絮新闻)。但是它促使美国国家航空航天局宣布火星计划的任务——把寻找以往或现存火星生物的证据当作火星探测的首要的和最重要的科学目标，并且每年将投入5,000万美元用于这项研究。

火星之所以适宜生物生存是因为数十亿年前火星上有液态水的存在。早些的探测发现了一些峡谷和深深的水流渠道，它们蜿蜒几百或几千英里一直向下延伸到北部平原。它们看起来像是经流水冲蚀而成的——大量的流水：一些特征显示它们看起来像一千条密西西比河水汹涌澎湃的巨浪冲刷出来的沟壑。但是最近人们进行了更多更深入的观察。火星轨道照相机拍摄到的一些图像，显示出一条长达500英里蜿蜒的峡谷，后被命名为纳内迪峡谷。经过仔细观测这些照片发现，将峡谷分开的那条河主要是靠地下水供应，美国地质调查局的地质学家米歇尔·卡尔如是说道。如果真这样的话，虽然现在火星表面温度很低，空气很稀薄以至表面无法留存液态水，但地层深处可能仍然有液态水。(在空气如此稀薄的空气里，水很快就沸腾了。）液态水对于生命来说，不是唯一条件却是必备条件。

现在火星上探测是否有水的迹象激起人们更大的兴趣。布朗大学的地质学家詹姆士·海德指出，那些流水的沟壑在北部高地并没有延伸很远，它们消失得真的很快。水到哪里去了？十年前，喷气推进实验室的以蒂莫西·帕克为首的科学家们对火星的旧照片进行了一番仔细的检查，认为他们在北部低地发现了一些长长的曲线。现在海德和他的同事们正向人们展示他们通过火星环球探测器(绕火星轨道运行)上的测高计得到的发现，发现表明这些曲线中至少有一条可能是古老的海岸线。首先，这条曲线位于接近常量的海拔，即你认为的应该是海岸线所在的

高度。(毕竟，以前所说的海岸线是地球上的海岸线标准)。而且这条曲线所环绕的低地非常平滑。海德说这种地形形成的一种可能性是冲进海洋里的物质不断沉积，就如同地球上那些最深的海底的形成过程一样。海德指出静水会通过蒸发形成水蒸气。在火星的古时期，水蒸气吸热使得大气变暖，这样气候就会从现在的寒冷状态转向温暖舒适的状态。

多年来，火星上之所以会形成这些曲线是因为环境太恶劣了：气候寒冷干燥，而且空气太稀薄，以至火星在对抗具有破坏性的太阳辐射时就像用纸伞对抗冰雹一样。但是静水阻挡了太阳辐射，而且这些海岸线也很有意思。从生物学上讲，如果只通过化学反应形成生物，你需要一些组成生命的基本元素(像核酸和蛋白质之类的化合物)，将这些混在一起的水，然后再通过一种能量使它们发生那至关重要的一次突变。这种能量可能来自热液喷孔的热量，也可能来自闪电。

当然，静水很久以前就消失了：火星上的诺亚时代在至少10亿年也有可能是20亿年前就结束了。假如表面没有液态水，火星上也就很难有生命存在了，或者看起来是那样。哈伯德说：“我们之所以拓宽了思路思考火星上何时何地可能存在生物，是因为我们在漆黑一片的地热通道和南极干涸的峡谷的岩石里发现了以氢气为食的‘微生物’。”地球上新发现了其他一些靠分解矿物质生存的嗜极菌——它们以岩石为食。还有一些嗜极菌生活在华氏212度的硫酸里，或生活在像醋一样酸或像氨一样刺鼻的环境里。很明显，生物很能适应生存环境。吉姆·海德说：“如果火星上曾经有生命存在，那么我要说你将花费大量的时间才能找到它。一旦表面不适合居住了，生物会转移到地下生活。”

目前为止，在确认人能够安全抵达火星并返回地球之前，人类将继续实行无人探测火星计划，不会派宇航员前去。要去的话需要足够的把握，如果火星上真的曾有生物存在或现在仍然有生物存在，那些生物不会对宇航员造成威胁。到2008年事情就会变得明朗化，届时一个派往火星的探测器将会带回火星上的土和岩石标本，供人们分析。在过去可能也有过类似输出的事件：一些科学家怀疑，如果生命最初起源于火星，那么地球上最原始的微生物就来自于火星。火星的引力场比地球小得多。当它遭受彗星或小行星撞击时，一块完整的火星石就飞出去了。如果那些最原始的生命乘着陨石飞落到地球上，这就意味着我们就已经发现了火星生物：远古太阳系流浪汉的那些后代——我们自己。

核心词汇

telescope ['teliskəup] *n.* 望远镜
cosmic ['kɔzmik] *adj.* 宇宙的
desolate ['desəlit] *adj.* 荒凉的,荒芜的
hotly ['hɔtli] *adv.* 激烈地，热心地
hospitable ['hɔspitəbl] *adj.* 好客的
downhill ['daunhil] *adv.* 下坡，向下
torrent ['tɔrənt] *n.* 激流，山洪
sinuous ['sinjuəs] *adj.* 弯弯曲曲的，迂回的
altimeter ['æltimi:tə] *n.* 高度计
frigidity [fri'dʒiditi] *n.* 寒冷，冷淡
toasty [təusti] *adj.* 暖和舒适的
nucleic ['nju:kliik] *adj.* 具核的，核的
hydrothermal ['haidrəu'θə:məl] *adj.* 水热作用的
sustain [səs'tein] *vt.* 承受，经受
inhospitable [in'hɔspitəbl] *adj.* 待客不亲切的，冷淡的
entrust [in'trʌst] *vt.* 信赖，信托
meteorite ['mi:tjərait] *n.* 陨石，陨星
interplanetary [,intə(:)'plænitəri] *adv.* 太阳系内的，行星间的

New Zealand Builds a Nest Big Enough to Save Kiwis

2. 新西兰建造足够大的鸟巢保护几维鸟

机经选粹

这篇文章的主要内容是有关新西兰几维鸟（kiwi）的，同时介绍了当地在保护几维鸟方面所做的努力。

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New Zealand Builds a Nest Big Enough to Save Kiwis

In the thousand or so years since humans discovered the remote islands that make up New Zealand, three-quarters of the indigenous bird species have been driven to extinction, and until recently, it looked as if the kiwi could follow.

That would be a loss for the environment, but also for national pride. The kiwi, a small flightless bird that nests in burrows, is the national bird and has become something of an improbable national symbol. The country's dollar is named after it, and New Zealand's residents are often labeled "kiwis" by outsiders.

Now, environmentalists are becoming more hopeful that a project started in 1994 will pull the beady-eyed bird back from the brink.

Kiwi numbers have declined rapidly over the past century, as populations struggled with the twin threats of shrinking habitat and expanding legions of new predators.

Hugh Robertson, who runs the Kiwi Recovery Program of New Zealand's Department of Conservation, estimates that there were as many as five million kiwis when European settlers arrived in the 1820s and that the population now stands at 75,000.

"It's because of people and introduced predators: ferrets, stoats, weasels, dogs, cats," said Jeremy Maguire, manager of the Willowbank Wildlife Reserve just outside the town of Christchurch. "They are a species in decline, and if it continues at the current rate, they will become extinct."

There are five species of kiwi, a smaller nocturnal relative of New Zealand's now-extinct moa, and, more distantly, the emu and the ostrich. All kiwi species are listed on the country's endangered species list. But two of them, the Rowi and Haast Tokoeka, are down to fewer than 300 birds, earning them a place on New Zealand's "nationally critical" list, its most extreme category of endangered species.

The near absence of mammals in New Zealand until they arrived with white colonizers meant that many bird species evolved into flightless ground-dwellers, leaving them vulnerable to the incursions of predators.

"In our case, the stage was set for a spectacular tragedy," said John McLennan, who has studied the kiwi for 20 years.

Mr. McLennan estimates that the kiwi's numbers are declining 2 percent to 5 percent a year, depending on the species.

"Our flightless birds took an incredible hammering," said Mr. McLennan, who is a trustee of the nonprofit organization Save the Kiwi.

The birds are insect eaters with an acute sense of smell and, because they are flightless, their feathers resemble hairs more than traditional avian plumage. Their bones are filled with marrow, again more like mammals than birds, which usually have hollow bones.

When humans arrived 1,000 years ago from other South Pacific islands, they used fire to clear the forests, starting an erosion of the kiwi's habitat that gathered speed over times.

And when the Europeans arrived, they brought other animals, which now pose the greatest threat. Kiwis evolved in a wooded environment where there were few natural predators apart from various eagles.

The adults weigh at least about 2.2 pounds, and can hold their own against many of the smaller predators, but young kiwis have fewer defenses. Surveys suggest that in the wild, only one in 20 kiwi chicks survives its first year.

Mr. McLennan said that the Conservation Department and other groups aiding the kiwi put out traps and poison to control the predators, but that has proved an expensive and far from complete solution.

So New Zealand's government agencies have partnered with local communities, nonprofit groups like Save the Kiwi and commercial operations like the Willowbank

reserve, to tackle the problem by trying to protect the birds until they have a better chance of defending themselves.

The plan, called Operation Nest Egg, is simple in conception but difficult to execute. Eggs are taken from kiwi nests in the wild and incubated in places like Willowbank. The newly hatched chicks are then taken to protected areas, many of them on isolated islands off the coast without predators, for about a year until they are big enough to fend for themselves. Then they are returned to the place their egg was found.

The program began in 1994, but it has taken a while to perfect the process. It is expected to pass something of a milestone early next year when it hatches its 1,000th chick.

Mr. McLennan says each chick that is returned to the wild costs about $2,750, a reflection of the difficulty in getting the eggs.

The remaining kiwis tend to live in remote corners of New Zealand, and each pair of birds—they remain monogamous for life—controls a territory ranging from 12 to 100 making it extremely difficult to find the nests.

The egg collectors travel with a "kiwi caller" who can imitate the call of a male kiwi, or sometimes a tape recorder. Male kiwis incubate the eggs, an evolutionary necessity because females lay eggs as large as 30 percent of their body weight and need time to recover.

When the males run out to chase off the intruders, the collectors can trace them back to the nest and take the egg to places like Willowbank.

Mr. Maguire, the Willowbank reserve manager, says the chicks seem to suffer few ill effects from not being brought up by their parents and seem to thrive on their return to the wild.

After a slow start, Operation Nest Egg is picking up momentum. Its success rate is rising, and similar programs are starting throughout the country.

Mr. McLennan is cautiously optimistic that Operation Nest Egg will stem the kiwis' decline.

"Because the rates of decline are relatively low at 2 to 5 percent, you don't have to add many birds back into the population to make it break even," he said.



自从约千年之前人类发现遥远的新西兰群岛以来，岛上3/4的本地鸟类已经濒临灭绝，直到最近，几维鸟似乎也有步其后尘的趋势。

这将不仅是生态环境之损，也是民族荣誉之失。几维鸟是一种小型鸟类，不会飞翔，但能打洞筑巢。作为新西兰国鸟，它已经成为这个国家不可思议的象征。甚至，新西兰元以它命名，并且新西兰的居民也通常被外人称为"几维"。

目前，环保人士正满怀期望1994年启动的一个项目将挽救这种濒临绝境、眼睛晶亮如珠的鸟类。

随着两种威胁即栖息地面积的缩小和天敌数量的增多，在过去一个世纪，几维鸟的数量急速下降。

休·罗伯逊主要负责运作由新西兰环境保护部门制定的几维鸟数目复原项目。据他估计，19世纪20年代欧洲移民者到来时，有500万只几维鸟，但现存几维鸟数目仅为7.5万只。

“原因在于人类和外来天敌：雪貂、鼬、黄鼠狼、野狗、野猫，”坐落于克兰斯特切奇镇外柳岸野生动物保护区的负责人杰里·马奎尔说道：“这个种群的数目在不断下降，如果以目前的比率持续这样下去，它们将会灭绝。”

几维鸟分为5类，包括一种体形更小、在夜间出没的已经灭绝的近亲恐鸟，以及远亲鸸鹋和鸵鸟。所有的几维科类都已被列入国家濒危物种名单。然而，其中两类即罗维几维鸟和哈斯托考加奇异鸟，数目已下降到不足300只，被列入新西兰“国家级危险”名单中。此名单包含有极濒危物种。

直到白人殖民者的到来，在新西兰才出现了濒临灭绝的哺乳动物。这也就是说许多鸟类进化成无飞翔能力的地上居住者，这让它们更易于受到天敌的攻击。

研究几维鸟20余载的约翰·麦克里安说道：“就目前的状况，我们已经到了特别危急的时候了。”

麦克里安估计，每年几维鸟的数量以2~5个百分点的速度下降，而且不同种类其下降速率不同。

作为保护几维鸟的非盈利性组织的理事，麦克里安先生又说道：“这些无法飞翔的鸟正遭受难以置信的重创。”

几维鸟以昆虫为食，嗅觉灵敏。由于不能飞翔，它们翅膀上的羽毛较之于一般的鸟类更多。其骨头充满骨髓，比起鸟类，它们更像哺乳动物，而鸟类通常有空心骨。

在1,000年前，当人类从南太平洋其他岛屿来到新西兰时，他们纵火烧毁森林，侵蚀几维鸟经数代发展而鲜有此规模的栖息地。

欧洲人登陆新西兰时也带来了其他动物，这些动物如今对几维鸟的生存构成了最大的威胁。几维鸟在森林中繁殖进化，除了数种鹰类，几乎别无天敌。

成年几维鸟体重至少2.2磅，可以凭此对抗许多体型较之小的天敌。然而，幼鸟抵御力稍差。调查显示，在野外20只幼鸟中几乎只有一只在它们出生的第一年得以存活。

麦克里安说过，自然保护区管理部和其他的组织设置陷阱、投放毒药用于控制几维鸟天敌的数目，然而，不容置疑，此举措太过昂贵，对于解决问题而言也是杯水车薪。

因此，新西兰政府携手地方政府成立非营利性组织如拯救几维鸟，以及商业公司如柳岸野生动物保护区，对几维鸟采取保护措施直到它们有能力更好地防卫自身来解决这些问题。

此项名为巢内鸟蛋保育计划，在理论上简单易行，实施时却困难重重。

收集几维鸟蛋要在野外的几维鸟巢里，并在柳岸这些地方孵化。随后新生雏鸟将被带至保护区中。这些保护区中有很多建造在没有其天敌生存、远离海岸线的孤岛上。它们在那里寄居一年，长到有足够能力自身防护时，就可以回归到出生地。

此项目开展于1994年，但是完善其进程花费了一些时间。正如预期所料，在下年初，这个项目将做出一件具有跨里程碑意义的事——孵出其第一千只幼鸟。

麦克里安先生说，每一只幼鸟放归自

然的成本是2,750美元，反应了收集这些鸟蛋的困难之大。

存活下来的几维鸟喜欢生活在新西兰偏远之地，并且每一对鸟儿——终生遵循一夫一妻制——占据着12~100英亩的地盘，使得寻找其巢穴困难重重。

鸟蛋收集人通过几维鸟呼唤器来巡视，该机器可以模仿雄几维鸟的叫声，或者用一种录音机来巡视。作为进化的需要，雄几维鸟孵化鸟蛋，因为雌鸟在生产达其体重30%的鸟蛋后，需要时间休息来恢复精力。

当雄鸟追出巢外，驱逐入侵者时，收集者们可以追寻它们的足迹，找到巢穴，并将蛋保存在像柳岸这样的地方。

柳岸保护区经理马奎尔先生说，似乎未经父母哺育的幼鸟几乎不受疾病威胁，并且在放归自然之后，茁壮成长。

几维鸟保育计划开始时，虽进程缓慢，现已经快速发展。其孵化鸟蛋的成功率不断攀升。全国各地也在开展相同的项目。

麦克里安先生对几维鸟保育计划可以有效阻止几维鸟数目下降持谨慎的乐观态度。

他说："鉴于下降率相对较低，只有2~5个百分点，所以不需要将很多的几维鸟放归自然，这样会让其数目再次下降。"

核心词汇

kiwi ['ki:wi:] n. 几维鸟
flightless ['flaitlis] adj. 不飞的
improbable [im'prɔbəbl] adj. 不可思议的，不可能的
environmentalist [in,vaiərən'mentəlist] n. 环保人士
brink [briŋk] n. 边缘
twin [twin] adj. 孪生的，两个的
settler ['setlə] n. 移居者
stoat [stəut] n. 鼬
manager ['mænidʒə] n. 经理
moa ['məuə] n. 恐鸟
extreme [iks'tri:m] adj. 极度的，极端的
colonizer ['kɔlənaizə] n. 殖民地开拓者，殖民者
incursion [in'kə:ʃən] n. 侵犯，入侵
hammering ['hæməriŋ] n. 打击，锻造
plumage ['plu:midʒ] n. 鸟类羽毛，翅膀
hollow ['hɔləu] adj. 空的，中空的
aid [eid] vt. 援助，帮助
incubate ['inkjubeit] vt. 孵蛋，孵化
milestone ['mailstəun] n. 里程碑
monogamous [mɔ'nɔgəməs] adj. 一夫一妻的
imitate ['imiteit] vt. 模仿，仿效
momentum [məu'mentəm] n. 动力，要素
cautiously ['kɔ:ʃəsli] adj. 慎重地
relatively ['relətivli] adj. 比较地，相对地

Back from the Dead: Scientist Revives Lost Plant of Old England

3. 起死回生：科学家使古老的英格兰已经灭绝的植物复活了

机经选粹

这一篇讲的是英国以前即将要灭绝的一种植物，后来又被保存了下来。



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Back from the Dead: Scientist Revives Lost Plant of Old England

This is the unlikely story of the native plant that came back from the dead.

For years it was thought to be extinct in Britain and, since this was the only place in the world it grew, on the rest of the planet, too. But thanks to the dedicated work of one extraordinary scientist, it has been saved, nurtured and returned to the wild. It is, The Independent on Sunday can reveal, the first extinct plant to be so restored in British conservation history.

The story would be a true wildlife fairy tale but for one thing: the plant in question is, in appearance, less a princess than an ugly sister. It is bromus interrupts, the interrupted brome, a grass, not a fetching flower, and so named because its seeds seem to have been picked away

at intervals along the stem.

It was discovered in 1849, growing as an arable weed in a field in Cambridgeshire, and over the next century or so, it was recorded in southern counties from Kent to Somerset. But from the 1930s, as farmers sprayed pesticides and more and more weeds were screened out, it went into steep decline and was last seen, not far from where it was originally found, in 1972. Later, it was duly declared extinct.

So it might have remained, a kind of green dodo, had a botanist, Philip Smith, not secretly squirreled away some seeds harvested from those last few plants in Cambridge. He took them home, grew them on his window sill, and, at a Botanical Society of the British Isles conference in 1979, produced with a flourish a pot of the risen-again bromus interruptus, bringing gasps and requests for seeds all round.

Some fell on stony ground: one scientific establishment found they didn't keep if stored at room temperature. But others found a safer footing at the Royal Botanic Gardens at Kew and Edinburgh, and it was grown on in horticultural "captivity". Botanists began to dream that the plant, almost the only one exclusive to southern England, could be returned to the wild. Its seed was safely stored, and Kew's Stewart Henchie began leading a team that intended to put the brome back into Britain.

Kew started growing as much as it could, as did Paignton Zoo, which has a tradition of fostering plants as well as animals. Last summer a far larger area was seeded, at English Nature's reserve at Aston Rowant in the Chilterns. Hundreds of plants germinated, flourished, and are now in fruit. Last week, word leaked out among botanical "twitchers" that the interrupted brome was back. Aston Rowant's manager, Graham Steven, is fielding calls from admirers asking when they can come to see it. The answer is now, in a field by the M40, just past the thistles.

If this work continues to succeed, the brome may prove to be not a thing of the past but merely, like its seed head, interrupted. And this project could be the first of many that return lost plants to the wild.

参考译文

这几乎是不可能的事：本土植物起死回生了。

几年以来，人们普遍认为它已经在英国灭绝了，因为这不仅是世界上，而且也是这个星球上它所生长的绝无仅有的一个地方。但是，值得庆幸的是，多亏一位出色的科学家的不懈努力使它得以存活下来，并得到精心培育，最终回归了大自然。星期天，无党派人士透露，就这样，第一批灭绝的植物在英国的自然保护史上复活了。

这个故事就像是一个野生生物的真实的童话故事，但是首先这种植物存在的问题是：在外观上，它比丑小鸭还少一点

公主气质。无芒草——生长被迫中断的无芒雀麦草——是一种草，而不是迷人的花儿，之所以得以此名鉴于它的种子看起来像是沿根茎处被挖走了。

它是在1849年被人们发现的。作为一种适宜田间种植的野草，后被种植在剑桥郡。大约又过了一个世纪，从肯特县到速莫尔赛特县这些南部的地区才开始对它有所记载。但是，自20世纪30年代开始，农民开始喷洒杀虫剂，不但阻止了越来越多的野草生长，而且使这种草也开始急剧减少最后消失不见。人们最后一次见到它是在1972年，而且是在离最初发现它时不远的一个地方。后来，理所当然地，它被宣布灭绝了。

因此，如果不是一种绿色渡渡鸟和一位名叫菲利普·史密斯植物学家——他秘密地把从剑桥最后几株植物那里收获来的种子储存起来，它没有可能被保存下来。他将那些种子带回家后，菲利普·史密斯把它们种在了窗台上。1979年，在英国植物学会会议上，一盆重获新生的无芒雀随之茂盛地生长起来了，人们渴望并请求将这些种子遍种各地。

一些人在石质土壤中种植失败；某项科学成果表明如果储存在室温下，种子将不能存活。但是另外一些人在克佑区及爱丁堡儿家皇家植物园发现了一个更安全的生长环境。它们可以生长在园艺“囚禁”区。植物学家开始梦想着这种在英国南方几乎是独一无二的植物能够重返荒野。其种子被安全地储存着。克佑区的斯图尔特·亨奇开始带领一个团队打算将雀麦草送回英国。

该草在克佑区就像佩恩顿动物园一样开始成长壮大。佩恩顿动物园有一个传统：不仅培育植物还养殖动物。去年夏天，在奇尔滕斯阿斯顿罗旺特区一个更大的区域被用于播种。许多植物开始发芽，茁壮地成长，现在开始结果。上周，据喜欢观察植物的人士透露，生长被迫中断的雀麦草又重获新生。钦慕者们纷纷打电话来询问阿斯顿罗旺特的管理人员格莱汉姆·史蒂芬：他们什么时候可以去参观雀麦草。答案就是现在，在一个四十平米的草场里，人们将会从这种植物旁经过。

如果这项工程继续取得成功，即可证明雀麦草不是像过去那样——仅仅像种子头一样，生长被中断。而且该工程可能是第一个帮助许多灭绝的植物重返大自然的工程。

核心词汇

dedicated ['dedikeitid] *adj.* 专注的，献身的
nurture ['nə:tʃə] *vt.* 养育，给予营养物
restore [ris'tɔ:] *vt.* 回复，恢复
bromus ['brəuməs] *n.* 无芒雀
interrupt [,intə'rʌpt] *n.* 中断
interval ['intəvəl] *n.* 间隔
arable ['ærəbl] *adj.* 可耕的，适合种植的
spray [sprei] *vt.* 喷雾，喷射
steep [sti:p] *adj.* 险峻的，陡峭的
duly ['dju:li] *adv.* 当然地，适当地
dodo ['dəudəu] *n.* 渡渡鸟
botanist ['bɔtənist] *n.* 植物学家
flourish ['flʌriʃ] *n.* 繁荣，茂盛，活跃
horticultural [,hɔ:ti'kʌltʃərəl] *adj.* 园艺的
captivity [kæp'tiviti] *n.* 囚禁，被关
exclusive [iks'klu:siv] *adj.* 唯一的，排外的
germinate ['dʒə:mineit] *vi.* 发芽，萌芽
brome [brəum] *n.* 雀麦草
thistle ['θisl] *n.* (植)蓟



Ants: Swarm Intelligence

4. 蚂蚁：群居的智慧

机经选粹

这一篇是讲蚂蚁的智慧。第一部分说蚂蚁很聪明，引起许多人来研究它们；第二部分说蚂蚁的交流方式以及和人类的交流方式的比较等；第三部分说蚂蚁通过基因来遗传，不像人类是教授给我们的孩子的，但是蚂蚁找食物或者打洞的本领却是后天学来；第四部分说的是关于蚂蚁的农耕本领。

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题源全文

Ants: Swarm Intelligence

The behaviour of ants has long fascinated scientists. And why not? These insects have the strength to carry food up to seven times their own body weight, and set up amazingly complex colonies, with social 'castes' in which every member has a role.

In fact, ants are not only fascinating just to entomologists looking at them under the microscope. In recent years, computer scientists have been paying great attention to the way in which a colony of ants can solve complex problems; in particular, how it finds the shortest route to a food source.

Each insect in a colony seemed to have its own agenda, and yet the group as a whole appeared to be highly organized. This organization was not achieved under supervision, but through interaction among individuals. This was most apparent in the way in which ants travel to and from a food source.

Ants form and maintain a line to their food source by laying a trail of pheromone, i.e. a chemical to which other members of the same species are very sensitive. They deposit a certain amount of pheromone while walking, and each ant prefers to follow a direction rich in pheromone. This enables the ant colony to quickly find the shortest route. The first ants to return should normally be those on the shortest route, so this will be the first to be doubly marked by pheromone (once in each direction). Thus other ants will be more attracted to this route than to longer ones not yet doubly

marked, which means it will become even more strongly marked with pheromone.

Soon, therefore, nearly all the ants will choose this route. But what if the ants happened to return from a longer route first, marking it most strongly? Computer simulations show that this problem is solved if the pheromone decays or evaporates slowly. This makes it harder to maintain stable pheromone trails on longer routes.

Studying this uncanny skill has enabled researchers to create software agents capable of solving complex IT problems, such as rerouting traffic in a busy communications network.

The Saharan Desert Ant has an equally amazing way of finding its way back to its nest, involving complex mathematics called path integration and horizontal projection.

There are about 8,000 species of ants in the insect family Formicidae (order Hymenoptera). They live all over the world, although they generally prefer warmer climates, and range in size from 2 mm to 25 mm (0.08~1 inch).

Ants live eight to ten weeks, passing through a four-stage life cycle—egg, larva, pupa and adult. The workers are sterile females and do the labour of the nest; the larger ones (the soldiers) defend the colony. At certain times of the year, many species produce winged males and queens. These fly into the air where they mate (with the male dying soon afterwards). The fertilized queen then establishes a new nest, and spends the rest of her life laying eggs.

The social behaviour of ants is among the most complex in the insect world. They communicate by touch and smell, constantly touching each other to pass on their nest odour. There are also some fairly aggressive tendencies exhibited by many ants *(which, fortunately for our children, recent animated films like Antz and A Bug's Life did not emphasize)*.

For example, ants have the ability to take over the nest of other ant species, via a 'parasitic queen' and 'enslave' the inhabitants. The queen will attack and kill the queen of the other species, and then cover herself with the odour of the other queen so she will be accepted by the colony residents. This is done by touching parts of her body to all the open wounds of the dead queen. She then lays her eggs, which are cared for by the colony ants. As the parasitic eggs hatch and the new queen's ants become more abundant, they capture the larvae of the original colony and use them as slaves when they hatch. These 'hostages' grow up and must take care of the upkeep of the nest and its invaders. Not a pretty thought!

All ants have amazing design features. They have two sets of jaws—the outer pair is used for carrying objects and for digging, while the inner pair is used for chewing. Some ants can lift food items (be they leaves, grains or other insects) that are up to seven times as heavy as themselves.

All ants play an important role in the economy of a fallen world. They control the population numbers of many other species. Ants can eat animals (vertebrates as well as other invertebrates like themselves), plants, and even the seeds of many plants, as well as eating and thus recycling dead organic material. Most ant species live in soil, but some, like carpenter ants, live in wood (although they don't actually eat the timber).

Ants are proficient hunters and are relentless in their search for a nest, food, or even slaves. They are able to mount a coordinated raid on an enemy colony, and are quick to defend their nests against intruders.

Some ants have what is described as mutually beneficial, or 'symbiotic', relationships with other insects, and even, in some cases, with fungi. One of the best examples of this mutualism occurs with aphids ('plant lice'). These sap-sucking insects produce a sweet, sticky substance known as honeydew, to which ants are highly attracted as a food source.

The way this relationship works can be seen in the Cornfield Ant and the Corn Root and Strawberry Aphids. Apparently to ensure they remain well supplied in honeydew, Cornfield Ants will foster these aphids, ward off any of their enemies and protect their eggs in winter. In the case of the Corn Root Aphid, Cornfield Ants will collect aphid eggs in the autumn (fall), protect them in their nests over winter, then in spring, carry the young to smartweed and grass roots, where they obtain nourishment. These young nymphs grow to become wingless females, called stem mothers, that can produce live young without mating. These stem mothers raise two or three generations on the host plant, after which the ants return to carry the aphids to young corn roots where the aphids breed another 10~20 generations.

Under the care of the ants, the aphids thrive. The ants gain the aphid honeydew 'excrement'; the aphids gain protectors who also act as 'chauffeurs'. However, the ants, not the aphids, appear to control the relationship. This is demonstrated occasionally when a winged female aphid is hatched, and then tries to fly off to a different host plant, away from the ants. It is then that the ants show their authority by seizing the female and carrying her back into their nest.

The ant's highly complex social structure, life cycle, strength, navigational abilities and the intelligence to 'farm' aphids, are all said to be the result of evolution. Such a claim defies logic and plaincommon sense.

When do evolutionists say that ants evolved? Britannica acknowledges that there is disagreement among entomologists as to when members of the order Hymenoptera first appeared on this planet. Some believe it was 225 million years ago (allegedly the same time as the first butterflies, moths and flies); others believe it was more like 150 million.

Britannica states that many fossil ants are known from the Early Tertiary Period (allegedly 60 million years ago), at which time 'males, females and workers were

already clearly differentiated'. Some of these fossil ants—supposedly 60 million years old—have been assigned to 'living genera'. In other words, fossil ants look so much like ants today, they are classified in the same genus! What this really means is that fossil ants were ants—no evolution has taken place.

参考译文

近年来，计算机科学家们倾注了大量的精力着力研究蚁群如何解决一些复杂的问题；特别是，它们如何找到通向食物源的最近路线。

蚁群里的每一只蚂蚁似乎都各司其职，但是作为一个整体，这个组织具有高度的组织性。并且这种组织性不是依靠监督而是通过成员之间的相互协作来实现的。蚂蚁们穿梭于蚁穴和食物源之间的方式就是对这一点的最好体现。

蚂蚁们排成一列并且保持这个队形向它们的食物源前进，同时它们会在沿途留下一些信息素。信息素是一种化学物质，同类成员之间对彼此的信息素非常敏感。它们沿途留下一定量的信息素，而每一只蚂蚁都会沿着有很浓信息素的方向前进。这能使蚁群尽快发现通往事物源的最近路线。通常第一批返回的蚂蚁都是那些沿着最近路线行走的，这也就使得该线路成为第一条被留下双重信息素的路线(来回各一次)。因此，信息素越多，其他蚂蚁就越容易被吸引到这里，而不是其他那些没有留下双重信息素的较长的路线。这样，那条最近路线上就会留下越来越多的信息素。

因此，很快，几乎所有的蚂蚁都会选择这条线路。但是如果碰巧选择较长路线的那些蚂蚁最早回来，使得它们沿途路线留下的信息素是最多的，那该怎么办？计算机模拟试验显示，如果信息素缓慢减弱或者蒸发，这个问题就得到了解决。信息素的减弱或者蒸发使得较长路线上的信息素含量更难以保持稳定。

通过研究这一不可思议的技能，研究者成功开发出了能够解决计算机一些复杂问题的软件工具，例如一个繁忙通讯网络中的重新布线问题。

全世界蚁科类(膜翅目)共有8,000多种蚂蚁。尽管它们一般喜欢比较温暖的气候，但它们仍然分布在世界各地，大小一般为2~25毫米(0.08~1英寸)。

蚂蚁一生分为卵、幼虫、蛹、成虫四个阶段，从卵到成虫这一过程需要8~10个星期。工蚁是没有生殖能力的雌蚁，它们负责蚁巢里的劳动事务；大一点的蚂蚁(兵蚁)负责蚁巢的保卫工作。很多种蚂蚁每年都会定时生育出一些有翅膀的雄蚁和蚁后。雄蚁和蚁后们飞到空中交尾(雄蚁不久后即死去)。受精了的蚁后会建立一个新的巢穴，它的余生就是不停地产卵。

蚂蚁的社会行为是昆虫世界里最复杂的社会行为之一。它们通过触觉和嗅觉来交流，相互间时常接触以传递它们所居蚁巢的气味。蚂蚁家族中也有一部分具有相当的侵略性。

例如，有的蚂蚁能够通过一只“寄生蚁后”来接管另一种蚂蚁的巢穴并“奴役”巢穴里原有的蚂蚁。一种蚁后攻击并杀死另一个种类的蚁后，然后将自己身上覆盖上被杀死的蚁后的气味，这样就能被原来的蚁群所接受。新蚁后将自己的部分身体与被杀死的蚁后身上所有暴露的伤口相接触，以获得死去的蚁后身上的气味。新蚁后会产下自己的卵，由蚁群负责照料。当这些寄生卵孵化出来以后，新蚁后的蚁群就变得庞大起来。它们俘获原来

蚁群的幼虫，这些幼虫孵化出来以后就被当作奴隶来使唤。这些“人质”长大以后必须负责照管蚁巢和它们的侵略者。真是一个糟糕的想法！

所有的蚂蚁都有奇特的外形。它们有2对颌——外面的一对负责搬运物品和挖掘搜寻，而里面的一对则负责咀嚼食物。一些蚂蚁能够举起相当于它们自身重量7倍的食物(如：树叶、谷粒或其他昆虫)。

在低等动物世界的经济里，蚂蚁们扮演着一个非常重要的角色。它们控制着很多物种的数量。蚂蚁的食物有动物(脊椎动物或像它们自己那样的无脊椎动物)、植物，甚至许多植物的种子，同时它们也吃腐烂的有机物，相当于将这些物质回收利用。绝大部分蚂蚁都生活在土壤里，但也有些蚂蚁，比如木蚁，生活在树木里(虽然它们实际上并不以木料为食)。

蚂蚁精于捕食，而且它们在寻找巢穴、食物甚至奴隶时都相当地冷酷无情。它们可以同心协力突袭敌群，也可以快速地保卫巢穴、抵御入侵者。

蚂蚁与其他昆虫，有时，甚至与真菌都有着一种互惠互利的关系，或者被称为“共生”。最典型的一个例子就是蚂蚁与蚜虫(“树虱”)之间的共生关系。这些吮吸树汁的虫子会分泌一种甜甜的黏黏的物质，即蜜汁，蚂蚁非常喜欢食用这种物质。

通过观察麦田蚂蚁、小麦根蚜虫和草莓蚜虫，我们可以了解生物之间的这种共生关系。显然，为了能够持续地获得大量蜜汁，麦田蚂蚁会将这些蚜虫收养起来，赶走它们的敌人，并保护它们的卵平安过冬。就拿小麦根蚜虫来说，麦田蚂蚁会在秋天把它们的卵收集起来，放在自己的蚁穴里以保护它们过冬。春天的时候，麦田蚂蚁会将蚜虫的幼虫带到荨麻和草的根部，在那里这些幼虫将获得生长所需的营养。这些幼虫然后会长成一些没有翅膀的母虫，即茎干母虫，它们不经过交配即可生育后代。这些茎干母虫会在寄生植物上繁殖2~3代。蚂蚁回来之后，就将这些蚜虫带到小麦根部，蚜虫在那里可以繁殖10~20代。

在蚂蚁的精心护理下，蚜虫这个种群迅速兴旺起来。蚂蚁可以获得蚜虫的“排泄物”蜜汁，蚜虫也可以获得保护者兼“司机”。然而，似乎由蚂蚁而不是蚜虫来控制这种共生关系。此事会被证实：偶尔会有一只有翅的蚜虫孵出后，试图飞到另一个寄生植物那里去，远离这些蚂蚁。这时蚂蚁就会显示自己的权威来：会将飞走的雌性蚜虫抓回到自己的巢穴。

蚂蚁社会结构非常复杂，生命周期很长、力气很大、导航能力很强，并且具有“饲养”蚜虫的高级智慧。有人认为这些是进化的结果，而这一观点是有悖于人们简单的逻辑常识的。

核心词汇

agenda [ə'dʒendə] *n.* 议事日程
supervision [ˌsju:pə'viʒən] *n.* 监督，管理
doubly ['dʌbli] *adv.* 二倍地，双重地
simulation [ˌsimju'leiʃən] *n.* 模拟，仿真
uncanny [ʌn'kæni] *adj.* 神秘的，不可思议的
pupa ['pju:pə] *n.* 蛹
sterile ['sterail] *adj.* 不毛的，不孕的
fertilized ['fɜ:tilaiz] *adj.* 已受精的
parasitic [ˌpærə'sitik] *adj.* 寄生的，靠他人为生的
hatch [hætʃ] *vi.* 孵，孵出
hostage ['hɔstidʒ] *n.* 人质
proficient [prə'fiʃənt] *adj.* 熟练的，精通的
intruder [in'tru:də] *n.* 侵入者，干扰者
fungi ['fʌndʒai] *n.* 真菌，蘑菇
mutualism ['mju:tjuəlizəm] *n.* 互利共生
honeydew ['hʌnidju:] *n.* 蜜汁，蜜露
aphid ['eifid] *n.* 蚜虫
smartweed ['smɑ:twi:d] *n.* 蓼，荨麻
nymph [nimf] *n.* 蛹，幼虫
excrement ['ekskrimənt] *n.* 排泄物，粪便
defy [di'fai] *vt.* 藐视，挑衅

Second Greatest Toolmaker? A Title Crows Can Crow about

5. 第二伟大的工具制造者？一个乌鸦具有发言权的论题

机经选粹

这一篇讲的是一种乌鸦是如何制作和使用工具的。

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Second Greatest Toolmaker? A Title Crows Can Crow about

The cognitive ability to design, make, standardize and use tools is widely thought to be a hallmark of human society, exceeding the capacity even of chimpanzees, mankind's brightest primate relatives. But a biologist who has spent three years studying a breed of crows in South Pacific rain forests reports that the birds actually make tool kits to extract worms and other prey from holes in trees and dead wood.

The toolmaking ability of these crows, he believes, is superior to any observed in other nonhuman species.

All corvidae, members of the crow genus, exhibit innate ability to solve many kinds

of problems. But according to Gavin R. Hunt, a biologist at Massey University in Palmerston, New Zealand, one species is special: Corvus moneduloides of the New Caledonia island group 900 miles east of Australia.

In a paper published on Jan. 18 in the journal *Nature*, Mr. Hunt said he had observed that "crow tool manufacture had three features new to tool use in free-living nonhumans, and that only appeared in early human tool-using cultures after the Lower Paleolithic: a high degree of standardization, distinctly discrete tool types with definite imposition of form in tool shaping, and the use of hooks".

Claims by scientists to have detected highly intelligent behavior in animals are often challenged by skeptics, and Mr. Hunt said in an interview that he expected sharp questions from his peers.

In a comment published in the same issue of *Nature*, Dr. Christophe Boesch, a zoologist at the University of Basel, Switzerland, questioned whether the tools Mr. Hunt observed crows making and using are truly planned or are merely shaped by trial and error for specific tasks. Only if the shape of the tool is preconceived by its makers can the process be considered "by some to be the characteristic of the existence of culture," Dr. Boesch wrote.

But whether crow toolmaking is planned or not, he added, Mr. Hunt' s "fascinating paper gives much food for thought and argument," showing at least that "tool use in birds is less stereotyped than previously thought."

A more positive assessment came from Dr. Randall L. Susman, an anatomist at the State University of New York at Stony Brook, who has extensively studied the anatomy and behavior of wild chimpanzees and other intelligent primates in the African wilderness.

"I' m not a psychologist," he said, "but if the birds Mr. Hunt has observed are actually shaping implements according to some plan, I' d call their activity cognitive. The only higher primates that make tools conforming to a preset template are human beings." Although chimpanzees use objects they find as tools, if they modify the objects at all, it is not according to any standardized pattern, he said.

During his research from 1992 to 1995 in four mountain rain forests of New Caledonia, Mr. Hunt watched moneduloides crows make and use two distinctly different types of tools, one of them hooked at one end, and the other made from a tapered piece of stiff leaf from the pandanus plant, with a barbed edge on one side.

To make hooked-twig tools, he said, the crows use their wide beaks to carefully pull



a twig away from a branch using a "nipping cut" to create a distinct hook at the twig' s end—the end the bird inserts into holes. Holding the twigs with their claws and shaping them with their beaks, the crows remove leaves, carefully shape the hooks and trim off the bark to make their tools smooth.

A second type of tool manufactured by the crows uses pieces cut from the stiff, jagged-edged leaves of pandanus plants. In finished form, these tools resemble locksmiths' picks, tapered to points and with serrated barbs along one edge; Mr. Hunt calls them "stepped-cut tools." To make one, a crow takes successively deeper bites from the section of leaf while it is still attached to the plant, and then bites off the finished implement. When the pointed end is inserted into a hole, the natural barbs along the edge of the leaf point outward so that withdrawing the tool snags and pulls up the prey.

Moneduloides are small crows resem-bling European jackdaws. They have broad bills with which they grasp their two types of tools in different ways. The hooked twig is held at an angle to the bill and the crow moves its head from side to side to probe a hole. To use a stepped-cut tool, the crow holds it by the broad end with the tip pointing straight ahead. The bird probes holes with it by moving its head back and forth.

Mr. Hunt compared the lengths and number of stepped cuts in tools made by moneduloides crows in three different areas, and found significant differences among them, perhaps suggesting cultural differences among neighboring crow communities analogous to differences among early human societies in the ways they shaped stone spear points.

Moneduloides crows evidently value their tools and try to keep track of them, Mr. Hunt said. When crows change their foraging sites they generally take their tools with them, he said, and when crows eat they generally grasp their tools in their feet. Sometimes crows leave their tools on secure perches while searching distant hunting grounds, returning later to retrieve their hooked twigs or stepped-cut leaves.

One of the few animal users of tools is the woodpecker finch, or Camarhynchus pallidus, one of 14 distinctive species of Darwin finches that evolved in the Galapagos Islands and are named for their discoverer, Charles Darwin. But the woodpecker finch does not make its tools. It plucks needle-like thorns from local plants and without modifying them, it uses the thorns as picks to tease prey out of holes. The brown-headed nuthatch of the Eastern United States uses bits of bark to probe holes for food, Mr. Hunt said.

Crows and sea gulls sometimes open whelks and other shellfish by dropping them

from a height on rocks, and sea otters use stones as tools to pound the shells of crabs and other prey held against their chests. But Mr. Hunt and many other scientists regard this as different from making tools.

In the wild, pygmy chimpanzees in East Africa modify stems or twigs to "fish" for termites in holes, Dr. Susman said, and in the Tai Forest of Cote d'Ivoire in West Africa during periods of drought and food shortage, he said, chimpanzees use stones to pound open hard nuts that are not normal components of their diet. But the shaping of stone nutcrackers by continued use appears to be accidental, with no plan in mind for making tools according to a standardized pattern, he said.

Nevertheless, the use of stones for cracking nuts seems to vary with different chimpanzee societies; on one side of the Sassandra River in Cote d'Ivoire, Dr. Susman said, the chimpanzees crack nuts with stones, and on the other side, they do not.

Chimpanzees in the wild modify leaves somewhat haphazardly to use as sponges and as umbrellas. Although this activity does not meet all the criteria for planned tool manufacture, Dr. Susman said, "there no longer seems to be a sharp dividing line between the cognitive behavior of apes and human beings." It may be, he said, that the distinctions between bird and human planned behavior has also been blurred; in any case, "humans are part of the continuum of animal cognition, not separate from it."

If New Caledonian crows intentionally modify their tools to specific shapes before using them, he said, their behavior is "qualitatively different from chimpanzees, and I' d call it cognitive."

Zoologists are revising traditional views of the relative importance of genes and learned behavior in young birds.

Experiments have shown, for example, that birds are born with an innate ability to sing the songs of their species, but that young birds need the examples provided by their elders to master the fine points of avian melody; a laboratory bird raised in isolation from others of its species never becomes expert in the songs of its race.

Mr. Hunt said that he had not noticed any evidence that moneduloides chicks learn the art of toolmaking from more experienced birds, but he was not able to investigate the question.

"One thing this kind of study does," he said, "is to impart a feeling of humility and greater respect for animal cognition."



参考译文

设计、制造、规范和使用工具的这些认知能力普遍被认为是人类社会的标志，这种能力甚至超过了人类最聪明的具有近亲关系的灵长目科的黑猩猩。但是，一位生物学家花了3年时间研究南太平洋热带雨林的一种乌鸦以后，报道说，这种鸟实际上是通过制造成套工具来从树洞和枯木中捕捉蠕虫和其他猎物的。

他认为，乌鸦制造工具的能力优于任何观察到的其他非人类物种。

所有鸦科的鸦类成员，显示出它们天生的能解决多种问题的能力。但据新西兰帕默斯顿梅西大学的生物学家加文·R.亨特称，有一个种类的乌鸦具有独特的能力，那就是位于澳大利亚以东900英里的新喀里多尼亚群岛上的新喀里多尼亚乌鸦。

在《自然》杂志1月18日发表的论文中，亨特先生说他已观察到“乌鸦制造的工具只出现在旧石器时代早期之后的早期人类使用工具的文化中，而且对于生活自由的非人类的工具使用者来说，它有3个新的特点：高度标准化、各种工具明显分离且样式固定、使用钩子”。

科学家们已经检测出动物的高智能行为这一宣称往往遭到怀疑者质疑，亨特先生在接受采访时表示他期待同行们提出更尖锐的问题。

发表在同一期《自然》期刊上的一篇评论中，瑞士巴塞尔大学的动物学家克里斯多佛·布伊希博士质疑亨特先生所观察的乌鸦制作和使用工具是否真正有计划性或者仅仅只是为了具体的任务而经过反复试验和错误而成。布伊希博士写道，只有当工具的形状由它的制造者事先预想出来后，这一过程才可以被认为是“文化存在的特性”。

他补充道，不论乌鸦制造工具是否为预想构思，亨特先生“令人着迷的报告给出了很多耐人寻味的想法和论据”，至少显示出“鸟类使用工具没有先前预想的那么老套”。

亨特先生于1992—1995年期间在新喀里多尼亚四处高山热带雨林进行研究，他观察到新喀里多尼亚乌鸦制作并使用了两种类型截然不同的工具，一种在一端有钩子，另一种是由露兜树属植物的一片锥形坚硬树叶制成，一旁还有一个带刺的边。

他说，乌鸦利用其宽大的嘴制造钩状树枝工具，它们用嘴小心地将一根细枝从树枝上分离下来，用“锋利的咬切”在树枝末端制作出一个明显的钩子——将此末端插入洞中。乌鸦用爪夹住树枝，并用嘴将它们弄成一定的形状，剔除树叶，仔细弄出钩型，然后除去树皮，以便使它们的工具变得平滑。

乌鸦制造的第二种工具使用从露兜树属植物的坚硬、边缘呈锯齿状的树叶上切下来的部分。这些成形的工具看起来类似于锁匠的工具，逐渐变细成一个点，一边有锯齿状倒钩，亨特先生将它们称之为“分级切削器”。做一个这样的工具，乌鸦需要从附在植物上的叶子部分不断深入地咬切，然后咬下已经做好的工具。当尖头末端被插入洞中时，叶子边缘的自然倒钩向外，以便撤出工具并且拉出猎物。

新喀里多尼亚乌鸦是类似于欧洲寒鸦的一种小乌鸦。它们宽阔的喙用不同方式衔住它们的两种工具。带钩的树枝被从一个角度用嘴夹着，乌鸦从一边向另一边移动头部以

探测洞穴。使用分级切削器时，乌鸦抓住它的宽阔尾端，使尖端点朝向正前方。鸟则通过前后移动头部来探测洞穴。

亨特先生对3个不同区域的新喀里多尼亚乌鸦制造的分级切削的长度和数目作了比较，发现了其中明显的差别，这或许暗示了邻近乌鸦区域的文化差异与早期人类社会制造石制抛掷尖物方式的差异相类似。

亨特先生说，新喀里多尼亚乌鸦显然很珍惜它们的工具并努力留意它们。他说，当乌鸦改变觅食场所时，它们通常会随身携带它们的工具，并且当乌鸦啄食时，它们一般也会用脚紧紧地抓着工具。有时乌鸦去远方觅食时会把工具放在安全的地方，之后返回重新衔回它们的钩状枝杈或分级切削叶。

他说，如果新喀里多尼亚乌鸦在使用工具之前有意地修改它们的工具成特别形状，那么从本质上来说，它们的行为"定性上讲与黑猩猩完全不同，我把它称为认知行为"。

动物学家正在修正对幼鸟基因和习得行为相对重要性的传统看法。

例如，实验已经表明，鸟类天生具有它们物种歌唱的能力，但幼鸟需要年长的鸟类给它们示范才能掌握鸟类曲调的微妙之处；一只实验用鸟被放在与其同类相隔离的环境中饲养，它永远也不可能成为其物种歌曲的专家。

亨特先生说，新喀里多尼亚小鸟是否是从其他经验更丰富的鸟类那里学习到制造工具的艺术的，他尚未发现任何证据证明这一点，但他也没有能力去调查这个问题。

"这类研究所做的一件事情，"他说："是传达一种谦逊的感觉以及对动物认知更大的尊重。"

核心词汇

hallmark ['hɔːlmɑːk] *n.* 品质证明，标志
prey [prei] *n.* 被掠食者，猎物
genus ['dʒiːnəs] *n.* 种，类
manufacture [ˌmænju'fæktʃə] *n.* 制造
Paleolithic [ˌpæliəu'liθik] *adj.* 旧石器时代的
discrete [dis'kriːt] *adj.* 不连续的，离散的
hook [huk] *n.* 钩子
preconceived ['priːkən'siːvd] *adj.* (思想、观点等) 事先形成的
pandanus ['pændərəs] *n.* 露兜树
barbed [bɑːbd] *adj.* 有倒钩的，带刺的
twig [twig] *n.* 小枝，嫩枝
claw [klɔː] *n.* 爪子
locksmith ['lɔksmiθ] *n.* 锁匠
implement ['implimənt] *n.* 工具，器具
jackdaw ['dʒækdɔː] *n.* 穴乌，寒鸦
grasp [grɑːsp] *n.* 抓住，紧握
probe [prəub] *vt.* 用探针测，戳
perch [pəːtʃ] *n.* 栖木，高位
qualitatively ['kwɔlitətivli] *adv.* 从质量方面看
melody ['melədi] *n.* 旋律，曲调
humility [hju(ː)'militi] *n.* 谦逊，谦虚

Earth to Aliens: We Haven't Had a Signal yet. Could You Try again?

6. 地球向外星人发出呼唤：我们还没有收到你们的信号，你们再试试好吗？

机经选粹

这一篇是关于探索太空是否存在生命的。

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Earth to Aliens: We Haven't Had a Signal yet. Could You Try again?

Does alien life exist? This is one of the most fascinating questions in the whole of science. I'm hopeful that we'll learn the answer by the end of this century.

In earlier centuries, many believed that the Moon and Mars were inhabited. The science fiction of Jules Verne and H. G. Wells popularised the idea of alien life.

We're less optimistic about Mars than our forebears were 100 years ago. There is certainly nothing there like the "Martians" of popular fiction.

An armada of space probes is being launched towards the Red Planet to analyse its surface, to fly over it and (in later missions) to return samples to Earth. Life

could also exist in the ice-covered oceans of Jupiter's frozen moon, Europa, and there are plans to land a submersible probe that could explore beneath the ice.

Detection of even the most primitive life would be a great discovery—it would offer clues to the mystery of how life began. Not even the optimists expect to find "advanced" life elsewhere in our solar system. But our Sun is just one star among billions. And in the vastness of space far beyond our own solar system we can rule out nothing. Other stars have their own retinue of planets circling around them, just as Earth and Mars circle the Sun. Could some of these planets, orbiting other stars, harbour life forms far more interesting and exotic than anything we might find on Mars? Could they even be inhabited by intelligent beings?

Claims that advanced life is widespread must confront the question first posed by Enrico Fermi, the great Italian physicist: if intelligent aliens were common, shouldn't they have visited us already? Why aren't they, or their artefacts, staring us in the face? Shouldn't we have seen so many UFOs that there's absolutely no doubt about them? This argument gains weight when we realise that some stars are billions of years older than our Sun: if life were common, its emergence should have had a head start on planets around these ancient stars.

But the fact that we haven't been visited doesn't imply that aliens don't exist.

It would be far harder to traverse the mind-boggling distances of interstellar space than to transmit a signal. That's perhaps how aliens would reveal themselves first.

Searches for extraterrestrial intelligence (SETI) have concentrated on "listening" for radio transmissions that could be artificial in origin, using large radio telescopes—this option is familiar from fictional depictions, such as Carl Sagan's *Contact*. Short stretches of data from the SETI searches have been downloaded by millions of people to use as screensavers on their home PCs each hoping to be the first to detect ET.

If we found such a signal, could we build up communication? Intelligent aliens would probably be hundreds of light years away, or more. Can we communicate with beings whose messages may take hundreds, thousands, even millions of years to reach us? There's no scope for snappy repartee.

I wouldn't hold my breath for success. But even if these searches fail, that doesn't mean that we are alone. The brains and senses of the aliens may be so different from ours that we couldn't recognise any patterns in their signals. Or they may not be transmitting at all. The only type of intelligence we could detect would be one that led to a technology that we could recognise, and that could be a minor and atypical fraction. Some "brains" may have a quite different perception of reality. Super-intelligent dolphins could be enjoying a contemplative life on some water-covered planet without us even knowing. Still other "brains"could actually be ass-emblages of "social insects". If evolution on another planet in any way resembled the artificial intelligence scenarios conjectured for the 21st century here on Earth, the most likely and durable form of "advanced life" may be super-intelligent machines whose



creators may long ago have been usurped or become extinct. There may be a lot more out there than we could ever detect, or even imagine. Absence of evidence wouldn't be evidence of absence.

Fictional aliens are usually depicted as mammalian bipeds. But the reality, as the new Science Museum exhibition shows, could be far more exotic. There's an enormous variety of life on Earth, from slime mould to monkeys. Far greater variety could exist elsewhere in the Galaxy; huge bulbous creatures floating in the dense atmospheres of Jupiter-like planets; aliens the size of insects on a planet where gravity pulled strongly; or they may be freely floating in space. The great astronomer Fred Hoyle wrote a classic science-fiction novel called *The Black Cloud*, in which a cosmos cloud permeated by swirling electric currents behaves like a super-intelligent brain.

We know too little about how life began, and how it evolves, to be able to say whether alien intelligence is likely or not. Indeed, if asteroid impacts and volcanic eruptions hadn't happened the way they did, we don't know whether the Earth would have ended up harbouring intelligent reptiles, or just insects: or would there be a convergence towards something humanoid? The emergence of intelligence may require such an improbable chain of events that it is unique to our planet.

Even if aliens don't now exist, they may exist in the far future. It has taken nearly four billion years for human beings to evolve from the first life on Earth. Our Sun has burnt less than half its nuclear fuel supply so it will be another six billion years before it flares up and dies. That allows time for descendants of the human species to evolve, here on Earth and maybe far beyond, into creatures as different from us as we are from protozoa.

参考译文

外星生命真的存在吗？这是整个科学界最具吸引力的问题之一。我对本世纪末我们能够寻找到答案充满期待。

早在许多世纪以前，许多人认为在月球和火星上有人居住。儒勒·凡尔纳和赫伯特·乔治·威尔斯的科幻小说使人们普遍认为有外星生命存在。

对于火星上是否有生命这一说，比起100年前我们的祖先，我们并不那么乐观。那里根本就没有像流行科幻小说中描述的"火星人"。

一艘装载有宇宙探测器的星际舰队将被发送到火星，任务是分析火星表层，飞过火星而且之后的使命是带回一些样本。在木星的冰封卫星——木卫二覆满着冰层的大海里也可能有生命存在，因此人类计划发射一个可以进行冰下探索的潜航探测器。

能够探测到哪怕是最原始的生命对人们来说也将是一项重大的发现——它将为揭开生命起源的神秘面纱提供一些线索，并不仅仅是那些乐观者期盼能够在太阳系的其他地方找到一些"高级"生命形

态。但是太阳只是数十亿颗恒星中的一颗。在广袤的宇宙里，我们对自己星系以外的其他地方一无所知。其他恒星也有绕其运行的卫星，就像地球和火星围绕太阳转一样。围绕其他恒星转的行星中有没有生命存在，而且远比我们在火星上可能发现的任何事物还要奇异有趣呢？甚至在这些行星上可不可能还住着一些智能生物呢？

认为高级生命形式普遍存在的这一观点与伟大的意大利物理学家恩利克·费米首次提出的问题形成了对峙。费米认为，如果智能外星生物普遍存在，他们怎么还不来光顾我们呢？他们或他们所开发出来的东西为什么不直接呈现在我们的面前呢？是不是我们看见过这么多的不明飞行物就能毫无质疑地确定它们存在？当我们意识到有些恒星的年龄比太阳要大数十亿年时，我们就得对这一观点予以重视了：如果外星人普遍存在，那么他们应该在我们之前就到过那些围绕着古老恒星运转的行星了。

但外星人没有拜访我们这一事实并不意味着它们就不存在。

要穿越星级之间那令人难以置信的遥远的星际空间比向太空发射一个信号要难得多。也许那就是外星人将如何首先暴露自己。

"搜寻地外文明"这项计划集中在用大型无线电望远镜"收听"最初可能是模拟信号的无线电波：这样的选择跟科幻小说里描述的有点像，例如卡尔·萨根的《接触未来》。"搜寻地外文明"计划搜集到的一些短距拉伸数据被无数人下载作为家用个人电脑的屏保，每个人都希望自己能够第一个发现外星人。

如果我们发现了这样的信号，我们能与外星人建立联络吗？智能外星生物可能住在离我们数百光年或更远的地方。我们能与他们交流吗？他们的信息传送到我们这里可能要经历数百年、数千年甚至数百万年的时间。没有人能够机智诙谐地回答这一问题。

我不会屏息注视"搜寻地外文明"计划是否能够成功。但即使搜寻失败，也并不意味着我们是宇宙中唯一的生命。外星人的大脑和感官也许和我们的截然不同，所以我们无法识别他们发出的任何一种信号，或者他们也许根本就没有发射什么信号。我们唯一能够探测到的一种信息将引发一种我们能够识别的技术，这一信息可能是微小的、支离破碎的片断。一些"外星人的大脑"也许与我们对现实的认识大不相同。超级聪明的海豚可能在一些甚至我们也不知道的有水覆盖的行星上过着一种沉思的生活。而且其他"外星人的大脑"可能实际上就是"群居昆虫"的集合。如果其他行星上以某种形式的生物进化和人们对21世纪地球上人工智能的设想有一点点相似的话，最有可能和最永久的"高级生命"形式可能是一些超级聪明的机器人，他们的发明者在很久之前已经销声匿迹。我们能够探测到或想象到的可能比实际的要少得多得多。缺乏证据并不能表明真的就没有。

科幻小说中描述的外星人通常都是长着两条腿的哺乳动物。但实际上，就像新科学博物馆展览会展示的那样，他们可能要长得怪异得多。地球上的生命形式从粘菌到猴子，有无数种。广袤无际的生命形式可能存在于银河系里的其他地方，巨大球茎状生物漂浮在像木星那样的星球的浓密的大气层里；像昆虫般大小的外星人生活在引力巨大的行星上；他们也可能是自由地漂浮在空间。著名的天文学家弗雷德·霍伊尔曾写过一篇经典的科幻小说《乌云》，小说中描述了一片宇宙云像一个具有超智能大脑通过旋转产生电流在宇宙中弥漫开来。

对于生命是如何诞生，如何进化的，我们知之甚少，所以我们无法确定外星智能生物是否存在。的确，如果小行星碰撞和火山爆发不以它们所表现的形式发生，我们不会知道地球最终是否会成为那些智能爬行动物或者仅仅是昆虫的避难所；或者是否都会向具有人类特点的事物集中进化？智能生物的出现也许需要发生一系列未必确实的事件，而这些事件是我们这个行星地球上所独有的。

即使外星人现在不存在，但在遥远的将来也可能存在。人类花了近40亿年的时间才从地球上第一个生命进化成现在的样子。太阳中的原核燃料燃烧还不到一半，所以距它燃烧殆尽并最终灭亡还有60亿年的时间。这足以使得人类的后代在地球上或者可能很远的地方去进化成与我们不一样的生物，就如同我们异于原生动物一样。

核心词汇

fascinating ['fæsineitiŋ] *adj.* 迷人的，有吸引力的
inhabit [in'hæbit] *vt.* 居住于
armada [ɑ:'mɑ:də] *n.* 星际舰队
beneath [bi'ni:θ] *prep.* 在……之下
vastness ['vɑ:stnis] *n.* 巨大
harbour ['hɑ:bə] *vt.* 庇护，藏匿
artefact ['ɑ:tifækt] *n.* 人工制品，加工品
argument ['ɑ:gjumənt] *n.* 争论
emergence [i'mə:dʒəns] *n.* 出现
alien ['eiljən] *n.* 外星人
traverse ['trævə(:)s] *vt.* 穿越
interstellar ['intə(:)'stelə] *adj.* 星际的
extraterrestrial [ˌekstrətə'restriəl] *adj.* 地球外的，宇宙的
download ['daunləud] *vt.* 下载
screensaver [skrin'seivə] *n.* 屏保
scope [skəup] *n.* 范围
dolphin ['dɔlfin] *n.* 海豚
extinct [iks'tiŋkt] *adj.* 灭绝的，熄灭的
creature ['kri:tʃə] *n.* 生物
swirl [swə:l] *vt.* 旋转
asteroid ['æstərɔid] *n.* 小行星
convergence [kən'və:dʒəns] *n.* 聚焦
humanoid ['hju:mənɔid] *adj.* 具有人类特点的，具人形状的
flare [flɛə] *vi.* 闪光
protozoa [prəutəu'zəuə] *n.* 原生动物

Biochemistry: Newfangled Chemicals

7. 生物化学：新药

机经选粹

这一篇是讲眼镜蛇分解一种毒液。讲科学家如何从蛇毒中发现中毒的原因，开始时研究了很多东西，但科学家还是没有发现什么，后来科学家研究眼镜蛇毒液的一些物质，以及科学家们如何研制出相应的药物。

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Biochemistry: Newfangled Chemicals

Deadly cobra poisons could give us the chemical key to new drugs to treat anxiety, stress and pain, reports David Bradley.

Your head spins and aches, you cannot keep your eyes open or string two words together, you feel sick and, worst of all, you don't care if you live or die. No, it isn't the morning after, this is how you feel after the Taiwanese cobra Naja naja atra has injected its lethal venom into your flesh.

British chemists now think they know why you feel like giving in and curling up to die, rather than fighting the venom's effects or beating up the offending snake. Their findings could lead to new drugs for treating severe anxiety, stress and pain. Mark Dufton and Lois Anderson of the University of Strathclyde, described how at the Royal Society of Chemistry's autumn meeting.

Researchers have been studying the way cobra venom kills for years. Venom, basically a specialised version of snake saliva, is pumped into the victim through the two hollow, needle-sharp teeth. Once into the victim's blood-stream, the venom's poisonous chemicals quickly circulate around the body. The most lethal toxins paralyse muscles, especially those that help you breathe. Death is mainly due to suffocation.

There are several different chemicals in cobra venom that work together to kill the victim. The structures of the paralysing toxins have been known since the sixties, but now researchers are puzzling over other chemicals in cobra venom that are not directly poisonous, but do seem to 'prepare' the victim for death. According to Anderson, there have been few clues: 'It's a mystery why the snake uses its resources making these compounds, they must be there for a reason.' Dufton's team, who are experts on proteins and their structure, knew that some of the extra components of cobra venom were like some digestive enzymes. They break down certain natural chemicals—peptides—by cutting them into pieces. But, explains Dufton, they surprisingly did not work on the peptides found in food.

The team set about finding the real target for these peptide breakers and studied different types of peptides, trying to find one that the venom singled out in the snake's victims. After years of effort, they discovered a type of peptide that seemed to fit the bill—they were broken down by the venom. There was a snag, however: breakdown took hours, whereas cobra venom acts in minutes.

From these early results, Dufton and his team deduced that the target peptides must have certain inbuilt chemical features, which very quickly narrowed down the search. "We acted on a chemical hunch," says Dufton, "and decided to test a group of peptides produced by the nervous system and adrenal glands, called enkephalins." These neuropeptides had the right chemical features, and the researchers found that cobra venom broke them down much more quickly than any other peptide they tested. Here was the possible target for the mystery components of cobra venom.

The team hacked their way through a jungle of scientific literature to find out which bodily functions might be blocked or altered by the peptide breakers in cobra venom. "Enkephalin is such an important chemical in the body," says Anderson, "that it seems to influence virtually everything!" Enkephalins affect our mood and how we feel pain (working like morphine and heroin). They can mobilise the body's defence systems during an emergency and are released into the bloodstream at the same time as adrenaline, the fight or flight hormone, when you are under stress. These chemicals produce just the sort of counter-attack that could make life awkward or even dangerous for the hungry cobra.

The researchers reasoned that if a chemical in the snake's venom interfered with the victim's enkephalin-controlled defences, it would give the snake the upper hand—so to speak—and its venom could carry on its sinister task unhindered. Without the will to fight the snake or its poisons, or even to run away, you would stand no chance. The snake could wait idly by, just waiting for you to die.

Dufton's team are purifying the components of the venom that breaks down enkephalin, and have discovered that several conspiring chemicals are needed for it to work. Two of these chemicals act similarly to the two chemicals that sit on the outside of nerve cells to break down enkephalins naturally as part of our own control of pain and mood. "Some of the mystery still continues, however," Dufton adds. "It now appears

that the venom deliberately makes another chemical from enkephalin." The researchers have not yet identified this compound or even what it does to the victim.

The peptide breakers in cobra venom dissolve in water, so it should be possible to make crystals in order that their exact chemical structure can be worked out. Once the team have this information, they can begin looking for ways to block or stimulate the versions found on nerve cells with the aim of artificially controlling the enkephalin-controlled systems.

Armed with this capability and a full understanding of the venom's ingenuity, the cobra's secrets could be exploited for human medicine. Researchers might find new ways to redress the balance of mood and behaviour in people with severe depression, as well as controlling over the top responses to stressful situations, and the feeling of pain. Whether they can continue with the research largely depends on the team obtaining further financial support. "Funding runs out for me this year," says Anderson. "It's an injection of grant money we need now!"



头昏，脑袋一直隐隐作痛，眼睛睁不开，根本无法思考，你感觉恶心，最糟糕的是，你根本不在乎自己是活是死。不，这不是因为你宿醉了。如果你肌肉被注射进台湾眼镜蛇的致命毒液的话，你就会有这样的感觉。

英国化学家现在破解了为什么你会自暴自弃，蜷缩着等待死亡，而不是阻止毒液起作用，或者与入侵的蛇作垂死挣扎。结果他们发现有望研究出一种治疗严重焦虑、压力和痛苦的新药。斯特莱斯克莱德大学的马克·杜弗顿和洛伊斯·安德森在英国皇家化学学会的秋季会议上解释了如何做到这一点。

研究者研究眼镜蛇的毒液如何致死已经有多年的历史了。基本上毒液是蛇的一种特殊唾液，通过蛇像针一样锋利的2颗中空牙齿注入受害者的体内。一旦进入受害者的血流，毒液的毒素就会很快扩延到全身。最毒的毒素会麻痹肌肉组织，尤其是那些帮助呼吸的组织，使受害者主要因窒息而导致死亡。

眼镜蛇毒素中几种不同的化学成分共同发挥作用并最终导致受害者死亡。60年代以来人们已经破解了导致人肢体麻痹的毒素结构，但是现在研究者对眼镜蛇毒素中的其他化学成分还一直迷惑不解，因为这些化学成分不是直接导致中毒，但似乎可能间接导致受害人死亡。据安德森称，这几乎没有线索可寻：蛇为什么把自身资源制成那些混合物，这是个谜，但它们必有其因。杜弗顿的小组中致力于研究蛋白质和其结构的专家，发现眼镜蛇毒素另外一些成分类似于一些消化酶。它们能分解某种天然的化学成分肽类，把它们分成碎片。但是杜弗顿解释说，令人不解的是，这种消化酶对食物中的肽类却不起作用。

该研究小组正着手寻找这些肽链破坏者的真正目标并已经研究了多种不同类型的肽，试图从毒蛇受害者身上提取的毒液中找到某一种肽。经过多年的努力，他们发现了一种似乎符合条件的可以被毒液破坏的肽类。尽管如此，但还是有一个障碍：这种分解需要花费数小时，而眼镜蛇的毒素起作用只需要几分钟。

杜弗顿和他的研究小组从这些早期的研究成果中推断出了要寻找的肽类具有特定

的内在化学特性，这很快缩小了搜索范围。杜弗顿说，我们做了化学试验，并决定化验一些由神经系统和肾上腺产生的叫做脑腓肽的肽类，这些神经肽类有相应的化学特性，并且研究者发现，跟测试的其他肽类相比，眼镜蛇毒素能很快地分解神经肽类。这可能就是眼镜蛇毒液中神秘成分的破坏目标。

研究小组从一系列科学文献中研究发现，当眼镜蛇毒素中破坏肽类者发生作用时身体的哪一些功能会受限制或者改变。安德森说，脑啡肽是人体中很重要的一种化学元素，它似乎对什么都有影响。脑啡肽像吗啡和海洛因一样影响我们的情绪和痛感。在紧急情况下，脑啡肽会激发人体的防御系统，并与肾上腺素——压力下所产生的一种反抗、逃避反应激素——一同被释放到血液中。这些化学物质会使人体形成一种反击力量，这种反击能使饥饿的眼镜蛇面临威胁，甚至有生命危险。

研究者推理说，如果蛇的毒液中的一种化学物质干扰了受害者由脑腓肽控制的反击，这样的话蛇就占了上风，或者说蛇的毒液可以毫不费力地使人致命。如果你没有要和蛇或其毒液作斗争的意志，甚至还想跑的话，那你就必死无疑。蛇可以悠闲地在旁边等着，只是等着你死。

杜弗顿的研究小组提取了能够分解脑腓肽的毒液成分，发现有少量一些成分会起到破坏作用。其中两种化学成分的作用和神经细胞外表的两种化学成分的作用十分相似，能够自然分解脑腓肽，而脑腓肽是能够抑制伤痛和控制情绪的一种物质。还有一些未知没解开，但是杜弗顿补充说：“似乎毒液会故意从脑腓肽中生成另外一种化学成分。”研究者还没有确定这种混合物是什么，也还没有确定他对受害者有什么伤害。

毒液中破坏肽类的物质能在水中溶解，那么就有可能提炼出其晶体以破解其准确的化学构成。一旦科学家得到了这一消息，他们就会开始寻找能够抑制或激活神经细胞外表的两种化学成分的方法，便可以人为控制脑腓肽控制系统。

有了这种能力和对毒液成分之精巧的充分了解，研究者有望利用眼镜蛇的秘密研制人类所需药品。同时他们可能找到调整人处于极度低落下的情绪和行为至平衡，控制人在很大压力的情况下的极端反应和痛感的新方法。他们能不能继续进一步研究在很大程度上取决于这个研究小组能否获得更多的经费支持。安德森说：“今年给我的资金已经用完了，现在我们需要的是大量资金的注入。”

核心词汇

spin [spin] *vi.* 旋转
flesh [fleʃ] *n.* 肉
severe [si'viə] *adj.* 剧烈的
cobra ['kəubrə] *n.* 眼镜蛇
saliva [sə'laivə] *n.* 唾液
poisonous ['pɔiznəs] *adj.* 有毒的
venom ['venəm] *n.* 毒液
paralyse ['pærəlaiz] *vt.* 使……无力
peptide ['peptaid] *n.* 肽
snag [snæg] *n.* 隐患，障碍
hunch [hʌntʃ] *n.* 块
enkephalin [enkefəlin] *n.* 【生化】脑啡肽
component [kəm'pəunənt] *n.* 成分
hack [hæk] *vt.* 劈
bloodstream ['blʌdstri:m] *n.* 血流
adrenaline [ə'dre:nəlaiz] *n.* 肾上腺素
defence [di'fens] *n.* 防御
unhindered [ʌn'hindəd] *adj.* 无阻的
researcher [ri'sɜ:tʃə(r)] *n.* 研究人员
stimulate ['stimjuleit] *vt.* 刺激
artificially [ˌɑ:ti'fiʃəli] *adv.* 人工地
ingenuity [ˌindʒi'nju:iti] *n.* 精巧
stressful ['stresful] *adj.* 紧张的

Ocean Warming Threatens Birds

8.海洋升温威胁鸟类生存

机经选粹

这一篇讲的是厄尔尼诺现象与海鸟之间的关系。解释了什么是厄尔尼诺现象，而海鸟是科学家最好的研究海洋生态的实验工具，因为它的捕食能力很强。又提及近年的厄尔尼诺现象特别的肆虐。接着讲了海鸟作为实验工具的其他好处。最后说有些人认为ALASKA的物种大量死亡是由于厄尔尼诺现象在作怪。但是科学家Hatch认为现在下结论为时过早。最近文章对此也没有明确的结论。

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Ocean Warming Threatens Birds

Warmer ocean waters have again hit the Pacific food chain.

On these craggy, remote islands west of San Francisco, the largest seabird colony in the contiguous US throbs with life. Seagulls swarm so thickly that visitors must yell to be heard.

But the steep decline of one bird species for the second straight year has rekindled scientists' fears that global warming could be undermining the coastal food supply, threatening not just the Farallones but entire marine ecosystems.

Tiny Cassin's auklets live much of their lives on the open ocean. But in spring they venture to isolated Pacific outposts like the Farallones to dig deep burrows and lay their eggs.

Adult auklets usually feed their chicks with krill, minuscule shrimp-like crustaceans. But not this year. Almost none of the 20,000 pairs of Cassin's auklets nesting in the Farallones will raise a chick that lives more than a few days, a repeat of last year's "unprecedented" breeding failure, according to Russ Bradley, a seabird biologist.

Scientists blame changes in West Coast climate patterns for a delay, for the second

consecutive year, in the seasonal upwelling of cold, nutrient-rich waters from the ocean's depths. Weak winds and faltering currents have left the Gulf of the Farallones without krill, on which Cassin's auklets and a variety of other seabirds, fish and mammals depend for food.

"The seas are warmer and the number of krill being produced is lower," said Bradley.

The failure of last year's Pacific upwelling killed seabirds from California to British Columbia. Scientists had hoped the change was just a natural temperature fluctuation. But the return of higher ocean temperatures and the scarcity of food resources this year have scientists wondering whether last year'serratic weather was not a fluke but the emergence of a troubling trend.

Without long-term data, scientists have so far found it difficult to make direct links between specific natural events and global warming.

But the Farallones present a special case. Researchers have kept Cassin's auklet counts there since 1967. Never before have they seen such a drop-off in numbers. It comes as California ocean temperatures hover a few degrees above average.

Perhaps nowhere is this ecological disruption felt more than here on the Farallones, although the krill-dependent whales and salmon that inhabit the surrounding waters have not appeared to suffer from the changes in food supply. But during a visit to the islands this summer, scientists pointed to other species feeling the consequences.

The absence of krill has led to a collapse of the juvenile rockfish population, the main food source for young of the common murre, a bird resembling a flying penguin. Though the murre has made a dramatic comeback recently, with about 200,000 adults nesting on the islands this year, nearly three-quarters of murres breeding this year are not expected to raise chicks that survive.

"At this point it's way too late in the season for the birds to initiate another attempt at breeding," said Peter Warzybok, a Farallones-based biologist. Significant drops in murre and Cassin's auklet numbers occurred during the El Nino years of 1983 and 1992, when warmer Pacific waters near the equator upset weather patterns worldwide.

A January conference issued a report describing last year's altered coastal climate as El Nino-like conditions in a non-El Nino year. The report said a "ridge" of winter air blocking winds from the Gulf of Alaska lingered more than two months longer than normal in 2005, which delayed the upwelling until well past the birds' breeding seasons.

"It's not just a local effect," oceanographer Frank Schwing said. "It's related to global-scale changes in atmospheric circulation."

Some climatologists warn against drawing overly broad conclusions from only two years of unusual weather. Definitive results are "not around the corner", said Nick Bond, a research meteorologist. "We just don't know how much the deck is stacked" by the effects of global climate change.

But whatever the cause, the ecological outcome if the trend continues is already clear, according to scientists. The Cassin's auklet is unlikely to adapt to the sudden loss of its main food source. And other animals could follow, Schwing said. In the worst case, he said, "we could see a great depression of the entire ecosystem."



参考译文

太平洋地区海水水温上升对这一地区的食物链再次造成威胁。

旧金山西部崎岖、偏远的岛屿是美国边界生生不息的最大的海鸟栖息地。海鸥成群结队，密密麻麻，以至于游客必须大声说话才能听见。

然而，有一种鸟类的数量连续2年急剧下降，这再次引起科学家们的担忧，全球气候变暖可能破坏了沿海地区食物供应链。这不仅会威胁到法拉隆湾，而且还会威胁到整个海洋生态系统。

卡森的小海雀大部分时间生活在广阔的海洋区域。但是在春天，它们会冒险飞往法拉隆湾这样的孤立的太平洋边缘地带，挖穴产蛋。

成年海雀通常用磷虾以及类似小虾的甲壳类动物喂养幼鸟。但今年是个例外。据海鸟生物学家诺斯·布拉德利说，在法拉隆湾筑巢的2万对卡森的海雀中，几乎没有一对海雀的幼鸟能多活几天，这重演了去年发生的前所未有的育种失败的悲剧。

往年，每到一定的季节，冰冷但营养丰富的海洋底层水就会涌向海洋表层，而这一现象已经连续两年推迟了。科学家指责说这就是美国西海岸气候模式发生变化的原因。风势减弱并且海流缓慢使得法拉隆湾地区的磷虾群已经消失了，而磷虾群又是卡森的海雀及其他各种海鸟、鱼类和哺乳动物赖以生存的食物。

布拉德利说："海域的温度越高，而磷虾的产量就会越低。"

去年，太平洋冰冷但营养丰富的海洋底层水没有涌向海洋表层导致了从加利福尼亚到不列颠哥伦比亚省的海鸟死亡。科学家们曾希望这种改变只是一种温度的自然波动。但是，今年海洋温度的回升以及食物资源的稀缺，令科学家怀疑去年天气的反复无常并非只是一种偶然，而是一种令人不安的趋势。

如果没有长期以来取得的数据，科学家们至今都很难发现在具体的自然事件和全球气候变暖的问题之间存在直接联系。

但法拉隆湾目前存在一个特殊的状况。自1967年以来研究人员一直保留有卡森海雀的数量。之前他们从未见过海雀数目如此减少的情况。而美国加州海洋的温度一直徘徊在高于平均温度几摄氏度以上。

尽管鲸鱼和鲑鱼，这些生活在周围水域并以磷虾为食物来源的鱼类，似乎并没有受到食物供应变化的影响，但或许没有其他任何地方比法拉隆湾的生态系统遭受的破坏更为严重的了。不过，今年夏天通过对这些岛屿的观察，科学家们指出，其他物种也已经感受到这种结果的影响。

磷虾的稀缺导致幼年岩鱼数量的减少，从而使以此为主要食物来源的海鸠——一种类飞行企鹅的鸟类数量锐减。

尽管最近海鸠的情况出现了戏剧性的好转——约20万成年海鸠在岛屿上筑巢，但是预计今年近3/4将要育种的海鸠并没有按预计的数量养活其雏鸟。

研究法拉隆湾流域的生物学家彼得·沃兹伯克说："在这一点上，在本季度让这些鸟类尝试另一种育种方式为时已晚。1983—1992年，即发生厄尔尼诺现象的这几年中，赤道附近不断变暖的太平洋水域破坏了全球气候模式，致使海鸠和卡森海雀数量显著减少。

1月举行的一次会议上发表了一份报告，该报告指出去年(非厄尔尼诺年)，类似于厄尔尼诺现象的沿海气候发生了改变。报告指出，阻挡来自阿拉斯加海湾的风的冬季气流比在2005年正常情况下多逗留了两个多月，从而延迟了鸟类的繁殖季节。

"它不仅是一个局部效应，"海洋学家弗兰克·施维英说："它关系到大气环流在全球范围内的变化。"

一些气象学家警告说，不要只根据这两年的反常天气而作过于笼统的结论。气象学家尼克说过，最终的结果"不在角落里"。他说："我们只是不知道全球气候的变化会导致多少问题出现"。

据科学家们称，不论是什么原因，如果这种趋势持续下去的话，生态系统(遭破坏的)后果是显而易见的。施维英表示，卡森的海雀对它们突然失去主食来源这种情况会不大可能适应。其他动物可能也将如此。在最坏的情况下，他说："我们会看到整个生态系统遭受破坏的现象。"

核心词汇

contiguous [kən'tigjuəs] *adj.* 邻近的，边界的
throb [θrɔb] *n.* 悸动，兴奋
undermine [ˌʌndə'main] *vt.* 渐渐破坏
threaten ['θretn] *vt.* 威胁，恐吓
auklet ['ɔ:klit] *n.* 小海雀
outpost ['autpəust] *n.* 边缘地带
crustacean [krʌs'teiʃjən] *n.* 甲壳类动物
breed [bri:d] *n.* 繁殖，育种
biologist [bai'ɔlədʒist] *n.* 生物学家
consecutive [kən'sekjutiv] *adj.* 连续的
mammal ['mæməl] *n.* 哺乳动物
fluctuation [ˌflʌktju'eiʃən] *n.* 波动，变动
wonder ['wʌndə] *vt.* 想知道
fluke [flu:k] *n.* 偶然
salmon ['sæmən] *n.* 鲑鱼
penguin ['peŋgwin] *n.* 企鹅
comeback ['kʌmbæk] *n.* 复原，恢复
chick [tʃik] *n.* 雏鸟
upwelling [ʌp'weliŋ] *n.* 喷出
meteorologist [ˌmi:tjə'rɔlədʒist] *n.* 气象学家
ecosystem [i:kə'sistəm] *n.* 生态系统

Are Clever Animals Actually Thinking?

9. 聪明的动物们真的会思考吗？



机经选粹

这篇讲的是动物行为能力，研究动物是不是和人一样有智慧，具有思考能力，然后举了几个例子。

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题源全文

Are Clever Animals Actually Thinking?

Holding a small feather in the tip of its bill, the heron patrols the edge of the brook, scanning the shallow water. Suddenly it freezes and focuses its attention on a small area of the stream. Then it deliberately drops the feather on that spot. A small fish rises to the feather lure and, in a flash, the heron strikes, catches the minnow and gulps it down.

This scene is one in which a bird with a brain less than a tenth the size of a human brain, employs a lure in much the same way a human angler uses a fly to catch a fish. The heron's behavior, is one of an increasing variety of complex phenomena, observed recently in animals, that seem to demand explanation in cognitive terms. Indeed, most scientists are now convinced that creatures ranging from bees to whales have mental capacities of far greater magnitude and intricacy than man had previously believed.

Some recently discovered examples of what appears to be cognitive animal behavior — an activity that entails what humans call thinking—include these:

— Insects that camouflage themselves so they can get close to their prey without being recognized.

— Birds that bury food supplies in hun-dreds of different places and remember the exact sites as long as a year later.

— Fish that show altruistic tendencies by guarding nests of unrelated fish who have to leave their broods.

— Ants that use gestures to indicate the kind of duties they want their co-workers to perform.

Though they may not happen often, such actions and scores of other examples of almost humanlike cognition have led ethologists, the scientists who study animal behavior, to ask: Do animals really have what we call intelligence? Can animals lower on the evolutionary scale than human primates have what we call a mind? How can we tell?

The tool-using heron seemed to show by its actions that its brain was capable of forethought, of devising a plan and of understanding what the execution of its plan would produce. Some researchers believe that such apparent cognitive abilities may exist in many animal species that had not been suspected of possessing such mental powers.

In Africa, Dorothy and Robert Seyfarth, ethologists from the University of California at Los Angeles, recently discovered that vervet monkeys use different warning calls for different kinds of predators, emitting alarm sounds that specifically signify the approach of eagles, poisonous snakes or leopards. The monkeys that have heard the warnings respond by taking evasive action appropriate for each predator; they climb trees to avoid snakes or hide in bushes to escape eagles.

In Indiana, Dr. Irene Pepperberg, a Purdue University biologist, has recently conducted experiments with Alex, a 6-year-old gray parrot, that contradict the generally accepted view that talking birds are merely mimics.

Having acquired a vocabulary of 40 English words, Alex can vocally identify some 50 different objects and can request them individually or refuse them if offered to him. He can tell how many objects are in a group, can indicate their color and shape and can categorize such a group by saying "four blue pegs." He can also ask to be moved to different parts of his room.

Intelligence of Birds

These learning abilities of parrots and monkeys are thought by many researchers to imply well-advanced cognitive capabilities similar to those of chimpanzees that have learned to communicate with humans through sign language, Dr. Pepperberg said. "We're finding out that birds are a lot more intelligent than we originally believed," she added in a telephone interview.

Discoveries such as these have inspired a miniexplosion of investigations and meetings

of ethologists, zoologists, biologists and psychologists to inves-tigate the subject of animal intelligence. They have also led researchers to the relatively new scientific discipline of cognitive ethology, the study of the conscious thoughts and feelings of nonhuman animals.

A few weeks ago, some two dozen scientists took part in a symposium on animal intelligence conducted by the Smithsonian Institution at the National Zoological Park in Washington. Ranging from such subjects as the social traditions of animal communities to the way chickens can be trained to dance, the participants discussed some puzzling facets of animal mentality and the questions they raise about the differences between animal and human intelligence.

Intelligence, the scientists generally agreed, is the quality of being aware of oneself as an entity in one's environment, and of being able to acquire and retain knowledge, to learn and understand from experience, to solve problems and to respond successfully to constantly changing situations.

But a question frequently asked by students of animal behavior is whether a particular animal action that seems intelligent is really a genetically pre-programmed act or an adaptive behavior pattern the animal has learned. In other words, instead of merely reacting instinctively to stimuli or situations, can some, or all, animals reason? Can they consider options, make choices and find ways to cope with altered environments or situations, abilities that are the hallmarks of human intelligence?

Dr. James L. Gould, a Princeton University ethologist, internationally known for his research on honeybee behavior, tends to think that most signs of animal intelligence are the result of innate "prewired" behavior patterns. Noting that "evolution can program very complex behavior into very tiny brains," he pointed out that bees, with about a milligram of brain matter—less than four ten thousandths of an ounce—can perform amazing feats.

These include intricate communicative dances that show foragers where food can be found in relation to the sun's position in the sky, the use of polarized light for navigation on partly cloudy days, and the solving of complicated orientation problems by the use of landmark "maps" in their heads. "It's all preprogrammed—innate," he told the symposium.

But recently Dr. Gould watched honey-bees perform a feat that made him wonder. In experiments suggested by the comments of Karl von Frisch, the pioneer of bee research, Dr. Gould observed bees as they flew to a food source he had carefully placed at increasingly distant sites from the hive. Each time he changed the site he moved the food source further from the hive by a factor of 1.25, or one-and-aquarter times the distance of the previous move.

He discovered that the forager bees began to anticipate where the food source would next be moved to, and that when he arrived at his carefully plotted new location, as far as 3,000



feet from the hive, he would find the bees circling the spot awaiting the arrival of their food.

At the Washington symposium he was asked if he could explain how these small insects could extrapolate, apparently arriving at a conclusion based on the unproved assumption that the distance to the next food site would conform to a pattern deduced from past experience. He replied, "I can't." And with a wry face he added, "I wish they'd never done it!"

Other acts of animals have puzzled ethologists. Some hawks kill their prey by drowning them. Wolves and other mammals use complex armylike group tactics to trap other animals. Vultures hurl rocks at ostrich eggs to break them open. Plovers feign injury to draw predators away from their chicks. Porpoises and bats have been found to have extensive and extremely sophisticated vocal repertories for use in communicating with their kin and others. And elephants and dogs sometimes seem to show humanlike emotions of affection and sorrow.

Scientists agree that these actions are indications of some measure of intelligence, but can it be measured, equated, or compared with human intelligence? Dr. William Hodos, a University of Maryland psychologist and an expert on the evolution and complexity of the animal brain, told the Smithsonian symposium that he found it difficult to do so.

"Don't forget that the role of language is so pervasive and complex in human problem-solving that one can't relate our intelligence to that of animals," Dr. Hodos said in an interview. Pointing out the difficulties in trying to compare animals with humans, he added: "If a porpoise is in a human environment, he won't do well. But how well would a human do in a porpoise's environment?"

But despite the difficulties of measuring the depth of animal intelligence, many researchers are hoping to find new ways of determining how animals cognitively direct their life strategies.

Among these is Donald R. Griffin, of the Rockefeller University in New York, whose book, *The Question of Animal Awareness* is regarded as a pioneering work in the field of animal intelligence.

Though he stops short of proposing that a scientist should become a Dr. Doolittle, the charming fictional character in Hugh Lofting's books who could converse with animals, Dr. Griffin has long thought that more research should be devoted to discover better ways of finding out what goes on in an animal's brain.

In an interview, he cited the vocal warning system of vervet monkeys and the gesturing of ants as examples of clever animal behavior and noted that "we're starting to use animal communication to get a window on their minds."

"There is a momentum to this science," he added. "The things we're finding out now would have been considered ridiculous or impossible in the 1930's."





参考译文

最近，有些人发现了貌似有认知能力的动物的行为，也就是一些与人类称之为与思考有关的活动的例子，如下所示：

——昆虫能够伪装自己，使自己在接近猎物时不被发现。

——鸟儿把食物贮藏在上百个不同的地方，而在一年后仍然记得储藏食物的精确位置。

——鱼儿无私地为那些不得不离开自己幼仔，与己毫无关系的鱼保卫巢穴。

——蚂蚁用动作指示出它们想让同伴执行的工作职责。

虽然这些行为不会常常发生，但这样的行为和许多其他近似于人类认知力的例子已经引发了个体生态学家们(研究动物行为的科学家们)的疑问：动物们真的拥有我们所谓的智力吗？在进化等级上低于人的灵长类的动物们拥有我们所谓的思维吗？这些问题，我们怎么解答？

在非洲，来自加州大学洛杉矶分校的个体生态学家桃乐西和罗伯特·赛法思近期发现，长尾猴会根据遇到的不同种的天敌发出不同的警报声。它们发出的警报声会具体地针对鹰、毒蛇或豹子的接近而有所差异。听到警报的猴子们会对每种天敌做出相应的逃避行为，它们爬到树上躲避毒蛇的袭击，或躲进灌木丛以逃离鹰的追捕。

在印第安纳州，普渡大学生物学家艾莲·派博珀格博士最近对一只6岁大的灰色鹦鹉亚历克斯进行的实验，反驳了被普遍认可的观点——鸟儿说话只是单纯的模仿。

已经习得了40个英语单词的亚历克斯，能识别50种不同的物体。如果把这些物体提供给他，他还能一个个地索要或拒绝。他能够说出一组里有多少个物体，并能指出它们的颜色和形状，还能说出“四个蓝色的衣夹”来将物品分类。他还会要求被移动到他房间的不同地方。

派博珀格博士说，很多研究者们认为，鹦鹉与猴子的这些学习能力意味着它们有高级认知能力，这是与已经学会了通过符号语言与人类交流的黑猩猩们所拥有的相似的高级认知能力。她在电话采访中还补充道：“我们发现鸟类比我们原先设想的要聪明得多。”

类似的发现掀起了小小的热潮——引起了行为研究者、动物学家、生物学家和心理学家以动物智力研究为主题进行调查和研讨。这些发现也引导研究者们进入了相对较新的科学课题——认知动物行为学和非人类动物的思想意识和感情的研究中。

科学家们普遍认可的智力，是指可以意识到自己是所处环境中的一个实体，以及可以获取和保存知识，从经验中去学习和领悟，解决问题，成功地对不断变化的环境做出反应的能力。

但是学生们经常会问到一个关于动物行为的问题：看似聪明的动物的特定行为究竟是基因上预先编排好的，还是后天学到的一种适应行为模式。换句话说，一些或者说所有的动物们都会进行思考，恰恰相反仅仅是对刺激和环境做出的本能反应吗？它们能够考虑可供选择的事物，做出决定，找出应对变化了的环境和形势的方法，发挥出带有人类智力特征的能力吗？

以蜜蜂行为的研究闻名世界的普林斯顿大学个体生态学家詹姆斯·L.古尔德博士认为，动物智力的大多数标志都是先天的“预先安排好的”行为模式的结果。当他注意到“进化会把非常复杂的行为编排入极为微小的大脑”时，他指出，大脑重量只有1毫克——不到1盎司的万分之四——的蜜蜂能做出惊人的技艺表演。

这些技艺表演包括：用错综复杂并携带信息的舞蹈告诉觅食者们食物的来源地，这是根

据天空中太阳的方位，在阴天利用偏振光做导航，或用它们脑海中有路标的“地图”解决复杂的定位问题。古尔德博士在研讨会上说：“这些都是事先编排好的——即与生俱来的。”

古尔德博士发现，采集蜂开始预料下次要去的食物来源地，而且当他到达精心策划过的新目的地时，哪怕那儿离蜂房的距离远到3,000英尺，他都会找到等待食物到达的在定点盘旋的蜜蜂。

在华盛顿研讨会上古尔德博士被问到，他是否能解释这些小昆虫是如何进行推断的，显然，这是基于尚未证实的设想——到下一个食源地的距离会与过去经验中推导出的一种模式相符——而得出的结论。他回答说：“我不能。”然后做了个鬼脸，补充道，“我倒希望它们从来没那样做过！”

动物的其他行为令行为学者感到迷惑了。有些鹰会把它们的猎物溺死。狼和其他的哺乳动物会用很复杂的类似于军事的群攻战术来围困其他的猎物；秃鹰会用力投掷石块砸破鸵鸟蛋；珩假装受伤将天敌引离它们的幼鸟；海豚或蝙蝠在发现其同族类后会用大量极其复杂的声乐汇编来与它们沟通；大象和狗有时候会表现出喜爱和悲伤等类似人的情绪。

马里兰大学心理学家以及研究动物大脑的进化与复杂性的专家威廉·霍多什博士在史密森尼博物馆研讨会上指出，科学家们认为这些行为是从某种程度上反映了智力的表现形式，但是它能被测量、等同于、且与人类的智力相提并论吗？他认为这是难以做到。

然而，尽管深入地测量动物智力困难重重，但是许多研究者都希望找到新的方法，来确定动物是怎样认知性地实行它们的生存策略的。

纽约洛克菲勒大学的唐纳德·R.格里芬也是这些研究者之一。他的著作《动物知觉释疑》被认为是动物智力研究领域里的一部开创性作品。

虽然格里芬博士暂时停止了这样的打算：一个科学家就应该成为像赫夫·罗弗庭书中虚构的魅力人物杜拉德博士一样，能和动物对话，但是格里芬博士长期以来都认为，有必要做出更进一步的研究，来找出发现动物大脑中思维的更好方法。

核心词汇

entail [in'teil] *vt.* 使必需，使蒙受
brood [bru:d] *n.* 窝
cognition [kɔg'niʃən] *n.* 认识，认识力
ethologist [i'θɔlədʒist] *n.* 生态学研究者，个体生态学家，行为研究者
signify ['signifai] *vt.* 象征，预示，意味
leopard ['lepəd] *n.* 豹
categorize ['kætigəraiz] *vt.* 将……分类
peg [peg] *n.* 钉，衣夹
miniexplosion [mini,ik'spləuʒən] *n.* 小小热潮
zoologist [zəu'ɔlədʒist] *n.* 动物学家
conscious ['kɔnʃəs] *adj.* 神志清醒的，有意识的，知觉的
adaptive [ə'dæptiv] *adj.* 适合的，适应的
honeybee ['hʌnibi:] *n.* 蜜蜂
milligram ['miligræm] *n.* 毫克
thousandth ['θauzndθ] *n.* 千分之一
ounce [auns] *n.* 盎司，英两
symposium [sim'pəuziəm] *n.* 讨论会，座谈会
extrapolate [eks'træpəleit] *vt.* 预测，推测
ostrich ['ɔstritʃ] *n.* 鸵鸟
equate [i'kweit] *vt.* 等同，使相等
cognitively ['kɔgnitivli] *adv.* 认知地，领悟地
converse [kən'və:s] *vi.* 交谈，谈话

Steering through the Navigation Theories

10. 通过导航理论指引路线

机经选粹

这一篇是讲鸟的定位的，具体介绍了几种鸟进行方向定位的方法和相关的实验。

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Steering through the Navigation Theories

Well, it's September and they're on their way. No, not the schoolchildren, the migrating birds. Ever wonder how they find their way to the right place and back? Here's the latest after 50 years of research on the subject.

In many species, the young, inexperienced bird does not head south in the company of older, experienced birds from whom they might learn a thing or two. Thus, the first idea that came to researchers' minds was that birds are simply born with the ability not only to find their way, but to leave at the right time.

This is called an endogenous (meaning it's within the bird) migratory program. The execution of this program, which takes a first-time migrant from its point of birth to its winter range at the right time of year, is called vector navigation. Based on painstaking experiments with blackcaps, tiny European warblers, Peter Berthold was able to show recently that these migratory programs are inherited.

But that isn't the whole answer, according to the review of avian orientation and navigation written by Kenneth Able in the May 1995 issue of *The Condor*. What about environmental influences? Changing weather conditions en route could disrupt orientation, displace migrating birds and even speed or slow their progress. So there must be some kind of adjustment or correction needed to deal with these

potential environmental problems.

Let's look at birds that are heading south for a second or third time. How do they find their way with such accuracy?

Many, including Able, agree, that birds have some sort of compass sense, whether they are migrant birds orienting themselves during migration or homing pigeons finding their way home after being released far away.

This has also been shown by placing birds in migratory condition into circular cages and simulating night and daytime conditions.

Each bird had available a single inked perch in the middle of the funnel-like cage. Its restless hopping behavior typical of a migrating bird caused it to leave inky footprints on paper spread out on the walls of the "funnel." When certain celestial conditions were simulated by placing the cages in a planetarium, the footprints indicated that the birds were somehow using the sun and/or stars as a compass.

"These results gave rise to the reasonable conclusion, still found in some textbooks, that diurnal migrants and homing pigeons relied upon a sun compass and night migrants upon a star compass," wrote Able. "Things turned out not to be nearly so simple."

Then, magnetic orientation appeared on the scene. A number of studies on pigeons, European robins, gulls, indigo buntings and other species indicated that birds possess a magnetic compass. These findings were bolstered by radar research that showed birds could orient themselves very well while flying in overcast skies. And there were more findings.

Sometimes wind direction took pre-cedence over all other environmental cues. More recently, other people discovered that patterns of polarized sky light at dusk were the main directional cues for night-time migrants.

This had a tremendous impact on the field of migration research. It meant that bird orientation did not rely on just one mechanism; birds used several cues to find their way.

According to Able, who has spent much of his scientific career studying the ways and means of migration in birds, most of the evidence suggests that in short-term orientation of nocturnal migrants, magnetic cues take precedence over stars, but visual information at sunset, i.e. patterns of polarized skylight, overrides both of these stimuli. On the other hand, homing pigeons appear to use the sun compass first and then the magnetic compass if the sky becomes overcast.

A hatching migratory bird is apparently born with a migratory direction coded with respect to two reference systems: the earth's magnetic field and celestial rotation (assessed by the stars at night and by patterns of polarized skylight during the day).

How they come to use them depends on a complex interplay of the abilities they are born with and their experiences with certain stimuli in the first few months of their lives.

And if that's not complicated enough, then there's the odor hypothesis. Some Italian scientists believe that homingpigeons learn an association between airborne odors and the directions that winds carry these odors past the loft. From this they form a mosaic "navigational map" of the surroundings of their loft.

This theory is controversial, to say the least. All sorts of objections have been raised over theolfaction theory. One of the most curious is the fact that only Italian pigeons seem to respond to the various experiments; German pigeons don't show the same results.

It would be easy to agree with Robin Baker's 1984 assessment that birds migrate, navigate andorientate using "several compasses and a mosaic map based on a number of unspecified landmarks." But Kenneth Able is not so sure. He feels that all of the pieces of the puzzle might be at hand but no one has yet put them together correctly.



九月份开始了，它们上路了。不，我说的不是上学的孩子们，而是迁徙的鸟儿。想知道它们究竟是怎样找到到目的地的往返路线？以下是科学家们对这个课题进行了50年的研究以后得到的最新发现。

许多种类的鸟中，年幼无经验的鸟并不是在那些年长的经验丰富的鸟的陪伴下向南飞——如果是这样，就可以揣测它们可能是从这些年长的鸟身上学到认路本领。因此，研究人员心里首先想到的是，鸟类天生就具备寻找路线和在适当的时间出发的能力。

这叫做内源性迁移程序(意思是鸟类内部的)。这个程序的执行即把首次迁徙的鸟儿在一年中适当的时候从出生地带到过冬的地方，叫做矢量导航。在对欧洲一种体形娇小的鸣禽——黑顶林莺进行了反复多次试验的基础上，彼得·贝托尔德最近指出鸟类这些迁移程序是遗传的。

然而，根据肯尼斯·艾博在1995年5月发表的《秃鹫》上所探讨过的鸟类定位和导航，那并不是全部的答案。环境因素呢？途中变化的天气条件会干扰它们的定位，使迁徙的鸟偏离原定路线，甚至加快或减缓迁徙的进程。所以，一定存在某种调整和修正的能力，以应变这些潜在的环境问题。

观察那些第二次或第三次飞往南方的鸟儿。它们是如何如此准确地找到路线的呢？

很多人，包括艾博，都一致认为不管是在迁徙途中自己定向的候鸟，还是在远方被释放的寻找回家之路的家鸽，都有某种指示方向的感觉。

把鸟装进设置有迁移条件的圆形笼子里，再模拟白天和黑夜，也可以证实上面的说法。

在漏斗状的笼子中间，每只鸟都有一个单独的涂有墨水的栖木。这些正在迁徙期的鸟不停地以它们典型的姿势跳跃，于是将墨水脚印留在了“漏斗”笼子四壁铺的纸上。当把笼子放到天文仪模拟出某些天文情境中时，这些脚印显示了鸟类以某种方式把太阳或星星当作它们的指示。

“这些结果引出了一个合理的结论，而且在一些教科书里仍可以看到：白天迁徙的候鸟和家鸽把太阳当作指南针，夜晚迁徙的候鸟就依靠星星作为指南针，”艾博写道，“但事情远没这么简单。”

接着，又出现了磁场定位的理论。对鸽子、欧洲知更鸟、海鸥、紫蓝鹀和其他品种鸟类的大量研究显示，鸟类拥有一个地磁指南针。雷达研究表明鸟类在阴云密布的天空里飞翔时仍能很好的定位，这更加加强了地磁指南针之说。而且，科学家们还有更多的发现。

有时候，风向比所有其他的环境提示更加重要。近年来，还有人发现黄昏时天空偏振光的模式是夜晚迁移候鸟的主要方向提示。

这对迁移研究领域产生了巨大影响。它意味着鸟类方向定位不是依靠单一途径；它们运用多种提示来寻找路线。

艾博研究鸟类迁徙的路线和方法占据了其科学研究生涯的大部分时间，据他所说，大部分证据都显示，在夜晚迁移的鸟类的短期定位中，磁场定位优于依据星星进行方向定位，但日落时的视觉信息，比如天空偏振光的模式，又优于这前两种动因。另一方面，家鸽似乎是首选太阳定位，而当天空变得阴沉，它就会改用地磁定位。

很明显，一只孵化的候鸟在出生时已经具有了迁移方向感，这种感觉遵循两个参考系统：地球的磁场和天体循环(晚上通过星星，白天通过天空偏振光的模式)。它们如何利用这两种参考系统依赖于其天生能力相互的复杂作用和出生后前几个月对特定的刺激获取的经验。

如果这些不足复杂的话，那么这里还有气味假设。一些意大利科学家认为，家鸽了解空气中传播的气味以及风把这些气味吹过它们的窝的方向之间存在某种联系。这样，它们就能构造一幅它们窝周围环境的综合“导航图”。

退一步说，这个理论颇具争议，反对意见颇多。其中最令人惊奇的是，似乎只有意大利鸽子对各种实验产生回应，而德国鸽子却显示出不同的结果。

1984年，罗宾·贝克认为鸟类迁移、导航和定位是依靠“若干定向基准和一张基于一些不确定的陆标的综合地图”，这种说法很容易得到认同。但肯尼斯·艾博对此不是很确定。他觉得关于这个问题的所有可能都迎刃而解了，只是还没有人把它们正确地总结在一起。

核心词汇

migrate [mai'greit] vi. 迁移
endogenous [en'dɔdʒənəs] adj. 内成的，内生的
migratory ['maigrətəri] adj. 迁移的，有迁居习惯的
execution [,eksi'kju:ʃən] n. 执行，履行
warbler ['wɔ:blə] n. 鸣禽
avian ['eiviən] adj. 鸟类的，鸟的
orientation [,ɔ(:)rien'teiʃən] n. 定位
potential [pə'tenʃ(ə)l] adj. 潜在的
compass ['kʌmpəs] n. 指南针
funnel ['fʌnəl] n. 漏斗
diurnal [dai'ə:nl] adj. 白天的
robin ['rɔbin] n. 知更鸟
indigo ['indigəu] n. 靛蓝
precedence ['presidəns] n. 优先，居先
directional [di'rekʃənəl] adj. 方向的
tremendous [tri'mendəs] adj. 巨大的
nocturnal [nɔk'tə:nl] adj. 夜的
override [,əuvə'raid] vt. 超过
rotation [rəu'teiʃən] n. 循环，交替
pigeon ['pidʒin] n. 鸽子
olfaction [ɔl'fækʃən] n. 嗅觉
orientate ['ɔ:rienteit] vt. 定向

Fire in the Night

11. 夜晚的荧光

机经选粹

这一篇是关于萤火虫的研究。

阅读题源

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Fire in the Night

As a child like many before and after him, Jim Lloyd was fascinated by fireflies but couldn't figure out why they lit up and what made it happen.

Now, however, the 70-year-old professor of entomology at the University of Florida can answer that question—and frequently does when children across the nation send him letters, often in envelopes addressed only: "Fireflies," University of Florida, Gainesville.

"They use (the light) for mate-seeking, but there are some females who seem to use it for landing, too,"Mr. Lloyd says.

It also can be used to lure prey and act as a defense mechanism as the light is used to camouflage the firefly.

It turns out that the approximately 2,000 different species of fireflies use their flashing light in different ways.

"The male Photinus pyralis, the species of these flying beetles most common in the mid-Atlantic area, uses a flash every four seconds to attract the female," says Abner Lall, a professor of biology at Howard University who has been doing research on fireflies for 30 years.

"After about one or one and a half seconds, the female responds with one short flash," Mr. Lall says.

"The male Photinus pyralis can tell the flash is coming from a female of the same species by the delay in the female's response. Males of other species might produce double or triple flashes, and the females might wait a longer or shorter time to respond. The norm for the females, independent of species, is to flash only once," Mr. Lall says. A sequence of flashes, therefore, would have the male flash, say, three times, the female respond with one flash, the male go through another sequence of flashes, and the female answer

with another single flash.

Another species-specific characteristic is the flight and flash pattern. The Photinus pyralis male flies and flashes in "J" formations.

The color of the flash also is different depending on the species. Fireflies that are out at dusk have a light yellow flash, while those out a little later at night have a greenish flash. Locally, the Photinus pyralis gives off the yellow flash and can thus be seen at dusk, while Photinus versicolor gives off a greenish flash and can be seen later at night.

The flashing or flirting goes on for a bit, until the female decides that this is her guy. Both female and male flash until the actual mating starts, and, well, the lights go out.

"But there is another twist in the male and female courtship," Mr. Lall says, "Have you heard of *The Femme Fatale*?"

Mr. Lall is not talking about Lauren Bacall or any other classic movie actress. The femme fatale of the firefly world is way more lethal.

"The femme fatale—after having mated—attracts another male and eats him," Mr. Lall says.

By feasting on a fellow firefly, the female makes sure her offspring get what they need in terms of nutrients.

A Chemical Process

The fireflies' flashes are created through a complex chemical process that has nothing to do with electricity.

"The chemical reaction takes place when oxygen interacts with a molecule called luciferin, an enzyme called luciferase and a molecule called ATP," Mr. Lloyd says.

This emission of light by any living organism, such as fireflies, certain fish and bacteria, is referred to as bioluminescence.

Just before the firefly flashes, be it for mating, luring prey, defense or landing purposes, its central nervous system sends an impulse to let in oxygen which reacts with the chemical compounds.

"Scientists are and have been working on adapting the chemical process in man-made technologies. It is used already in medicine when diagnosing certain bacterial infections," Mr. Lloyd says.

There Is Still More to Learn.

"Nature certainly has a lot of secrets that we can learn from," says Gary Hevel, an entomologist at Smithsonian's National Museum of Natural History. "The firefly flashes is one of them...Imagine having a light that sustains itself in a tunnel or in a mine. It would be pretty convenient," Mr. Hevel says.

One of the most commonly seen human adaptations of bioluminescence is glow sticks, the kind often sold at amusement parks and rock concerts.

To see the chemical reaction at work in nature, Mr. Lloyd recommends visiting any stretch along the Potomac River or taking a trip to Point of Rocks, Md., near Frederick.

The best time to catch a firefly show is in June, July and August, but some may be out flashing already in May.

"Males in this area usually fly higher than females, which usually are settled in bushes or on the ground. In other areas of the world, fireflies don't actually fly around," Mr. Lall says, "In desert areas, for example, they often live in termite mounds."

"The termite mounds are lit up like apartment buildings in Manhattan," he says.

Beetle Full of Complexity

"Fireflies spend most of their lives as babies, or larvae, while their adult life is very short, just a few weeks in some species," Mr. Lloyd says. The larval phase can last for a year.

"It's a high-risk occupation to fly around," Mr. Lloyd says of the short adult life span.

"Everything from rain storms to spider webs threatens the fireflies' existence," he says, "Other threats include human sprawl."

"They seem to be very habitat-sensitive," Mr. Lloyd says, "and we're taking up more and more space, and we've lowered the water table, which affects them."

"Just as migratory birds get confused by cell-phone towers and high-rises, fireflies can be confused by light from human activity, too," he says.

Mr. Lloyd says the greatest threat is not that all fireflies may disappear because of increasingly unfriendly environments, but that some species, perhaps ones scientists haven't cataloged yet, will become extinct.

About 125 species have been named in the United States, and Mr. Lloyd is getting ready to name an additional 30 to 40 based on his research.

It may not seem a big deal to some for a few bugs to disappear, but Mr. Lloyd doesn't take it lightly because these little creatures, most less than an inch in length, still hold unresolved mysteries: How do they perceive color? Are there other ways they use their flashes?

Fireflies continue to capture the interest of scientists and children alike with their behavior and biochemical capabilities.

"Fireflies are so complex, you can't even believe it," Mr. Lall says. "We keep discovering new things about them."

参考译文

像许多在他之前或之后出生的孩子一样，吉姆·劳埃德小时候很迷恋萤火虫，却不明白为什么它们会发光，是什么使它们发光。

然而，身为佛罗里达州大学昆虫学教授的他已是70高龄，现在可以回答这些问题。每当小孩子从全国各地写信给他，信封上通常只写着："萤火虫"，盖恩斯维尔佛罗里达州大学，他也常常予以回复。

劳埃德先生解释说："萤火虫通过荧光寻找交配对象，但是一些雌性萤火虫也利用它来降落。"

同时，它还可以用来诱捕猎物，以及用作防御工具，因为光可以用来掩饰萤火虫。

调查结果显示，大约有2,000种不同种类的萤火虫以不同的方式使用它们的荧光。

一位来自哈佛大学研究萤火虫30载的生物学教授阿贝乃尔·拉尔说道：“雄性北美萤火虫——这些种类的飞行甲虫在大西洋中部地区很常见——以每隔3秒的频率发出荧光以吸引雌性。”

拉尔先生接着说道：“一秒或一秒半之后，雌虫便以更短促的闪光作为回应。”

拉尔先生说道：“雄性北美萤火虫依据雌性反应停顿时间来判断光是否来自于同一族群的雌性。其他种群的雄性发出2~3次闪光，而雌性会在停顿的时间或长或短之后做出回应。对于各类雌性萤火虫基本上都只发1次闪光。”因此，假设雄性发出一系列光，假如说大约闪3次，雌性仅仅闪光1次回应。雄性发出另外一系列光，雌性也仅仅回应一次闪光。

另外一个种群特征在于它们的飞行和发光方式。雄性北美萤火虫以J字形飞行发光。

不同的种群发出的光的颜色也有所差异。傍晚时分出来的萤火虫发出淡黄色的光，而晚些时候出来的萤火虫发出绿色的光。在当地，在黄昏时可以看到北美萤火虫发出黄色的光，而在晚一些的时候可以看到杂色萤火虫发出绿色的光。

雄虫边飞边发光或者卖弄风情，直到雌虫决定它就是她的最佳配偶。雄虫和雌虫继续闪光直到真正开始交配，然后停止发光。

“然而，在雌雄萤火虫交配过程中还有一个变化，”拉尔先生说道：“听说过《蛇蝎美人》这部影片吗？”

他不是在说劳伦·巴尔考或是其他一流电影女演员。而是表达红颜祸水在萤火虫世界更加惨烈之意。

劳尔先生说道：“红颜祸水指的是交配后的雌虫会吸引另一雄虫，并且吃掉它。”

通过吞食同伴，雌虫确保了它的后代在哺育过程中能获得足够多的营养。

萤火虫发光通过一个复杂的化学过程产生，与电无关。

劳埃德先生说道：“当氧气与荧光素、荧光素酶以及三磷酸腺苷分子相互作用时会发生化学反应。”

任何活体，如萤火虫、某种鱼类和一些细菌的发光指的是生物体发光。

不管萤火虫发光的目的是为了交配或是诱捕猎物，防御或是降落，它们的中枢神经系统都将发出一个吸进氧气的脉冲信号，这样氧气会与一些化学合成物发生反应。

劳埃德先生说道：“科学家们一直在人工仿造这种化学过程。现在已经运用在医药业来诊断一些细菌感染病例。”

“自然界确实存在许多值得我们学习的秘密，”史密森尼国家自然历史博物馆的昆虫学家格雷·赫哲说道：“萤火虫发光就是其中之一……想象一下自己身上有光，在隧道和矿井中前行，该是多么方便啊。”

人工仿造生物体发光最常见的产物之一就是荧光棒，在许多娱乐场所和摇滚音乐会上均有出售。

为了观赏自然界中的这种化学反应，劳埃德先生建议去游览波拖马可河沿岸或去马里兰州的洛斯旅游，后者就在弗雷德里克的附近。

观赏萤火虫发光的最佳时节是在六、七、八三个月。但是有一些种类的萤火虫在5月就不发光了。

“此区域的雄虫较雌虫飞得高，它们经常栖息在灌木丛或地面上。世界上其他地方的萤火虫并不飞来飞去，”劳尔先

生说道："在沙漠中，它们通常生活在白蚁穴里。"

他说："发光的白蚁之穴像曼哈顿的建筑物。"

劳埃德说道："萤火虫一生大部分时间都是以幼虫形态存在，而成虫期时间则很短——甚至一些萤火虫物种的只有几周左右。"幼虫期可以持续1年。

他在谈到如此短促的成虫生命阶段时说道："到处飞舞是一项高度危险的工作。"

"从诸如雷雨到蛛网的所有事物都将危及萤火虫的生命，"他说："其他威胁还包括人类捕捉。"

"它们似乎对栖息地很敏感，"他说道："所以，我们正在占据愈来愈多的空间，并已降低了地下水位，这些都会对它们造成影响。"

劳埃德先生说道："如同候鸟会受到手机信号塔和高层建筑物的干扰一样，人类制造的光也会对萤火虫产生干扰。"

他说道，最大的威胁不是因为日益恶劣的环境而导致所有的萤火虫消失，最糟糕的情形是一些种群还未被科学家们编类就将灭绝。

在美国大约有125种萤火虫已被命名，而且劳埃德先生正准备在研究中给其他30~40种萤火虫命名。

一些甲虫的消失对某些人来说似乎不值一提。但是劳埃德先生不敢稍有怠慢，因为尽管它们大部分不足1寸长，但这些小生物却掩藏着许多有待解决的秘密：它们如何感知颜色？它们有其他方式来利用这些发光吗？

萤火虫因其行为方式和生化功能仍吸引着科学家们和孩子们。

核心词汇

fascinate ['fæsineit] *vt.* 令人入神，使着迷
firefly ['faiəflai] *n.* 萤火虫
entomology [entəu'mɔlədʒi] *n.* 昆虫学
envelope ['enviləup] *n.* 信封
lure [ljuə] *vt.* 引诱，以诱饵吸引
camouflage ['kæmuflɑ:ʒ] *vt.* 伪装，掩饰
beetle ['bi:tl] *n.* 甲虫
flash [flæʃ] *n.* 闪光
species ['spi:ʃiz] *n.* 物种，种
dusk [dʌsk] *n.* 黄昏，傍晚
greenish ['gri:niʃ] *adj.* 呈绿色的，微绿的
mating ['meitiŋ] *n.* 交配
lethal ['li:θəl] *adj.* 致命的，致死的
offspring ['ɔfspriŋ] *n.* 后代，子孙
nutrient ['nju:triənt] *n.* 营养物
luciferin [lu'sifərin] *n.* 荧光素
enzyme ['enzaim] *n.* 酵素
luciferase [lju:'sifəˌreis] *n.* 荧光素酶
bioluminescence ['baiəuˌlu:mi'nesns] *n.* 生物体之发光
amusement [ə'mju:zmənt] *n.* 消遣，娱乐
termite ['tə:mait] *n.* 白蚁
additional [ə'diʃənl] *adj.* 另外的，额外的
unresolved ['ʌnri'zɔlvd] *adj.* 未解决的
biochemical [ˌbaiəu'kemikl] *adj.* 生物化学的

Caring for our Cuddly Icon

12. 关注我们可爱的动物

机经选粹

这一篇是说考拉数目下降，因为人(settlers and their descendents)，最大的killer是car，还有森林大火，不过还好，挑食的考拉爱吃的桉树生命力很顽强。然后提到考拉小肠里有一种bacteria帮助消化，好像是因为桉树有某种toxic物质，总之考拉要一天21小时不活动才可以fully digest the food。后面就说考拉很温柔，完全不会攻击人，upset了只会hiccup什么的，考拉生病的话都不哭不闹的，总之很难看出它们病了，要每天称体重才看得出来。之后提到考拉不可以给人抱的，因为它太delicate了，比较喜欢cling to holder's arms。最后说澳洲把考拉当外交大使，澳洲动物园让游客抱考拉，其实这是很不好的。不过现在澳洲政府总算想到要限制这种行为了，一些动物园已经不让游客抱考拉了。



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Caring for our Cuddly Icon

The koala is one of Australia's most easily recognised and adored animals. But despite their popularity, koalas in the wild are threatened by dwindling habitat and the pressure of urban development. Education Editor EMILY RICE discovers what you can do to help.

Cute and cuddly, the koala is an Australian icon and contributes millions of dollars to our tourism industry each year. But despite worldwide adoration, humans still continue to threaten the life of the koala.

Habitat

Koalas are found in four Australian states—Southe Australian, New South Wales, Victoria and Queensland. But the distribution of the koala is dependent on the suitability of habitat.

Today, koalas prefer to live on coastal and inland forests and woodlands.

It is believed that thousands of years ago koalas' ancestors may have lived in rainforests.

Stable koala populations occur only where the marsupial can access its favourite trees and where there are other koalas. Historically, koalas were found only in SA's South-East but were hunted to extinction by the early-1920s.

But the population was re-established between 1920 and 1960 when koalas from Victoria were introduced in an attempt to preserve the species.

In SA, koalas are found mainly in the Adelaide Hills and foothills, Mt Lofty Ranges and on Kangaroo Island, with a few scattered populations on Eyre Peninsula and in the Riverland.

The Australian Koala Foundation estimates the combined wild population in SA and Victoria is between 10,000 and 15,000.

Description

The koala is a marsupial, which means it carries its young in a pouch. Despite sometimes being referred to as a "bear", the koala is no relation to the beasts found overseas. In fact, its closest relative is the wombat.

Koalas are arboreal —meaning they live in trees and are well adapted to life in the treetops.

In addition to having an excellent sense of balance, the koala has rough pads on the palms and forehands, with two thumbs and three fingers to allow them to grip strongly when climbing.

Like many native Australian animals, they move around at night and are most active just after sunset.

Koalas have thick, almost woolly fur which protects them from hot and cold temperatures. The koala has a hard plate on its rump to make sitting in the fork of trees more comfortable.

Diet

The koala lives on a diet of eucalypts. Despite more than 600 different species of eucalypt nationwide, the marsupial dines on only about 20 to 30 species of Australian eucalypt leaf. Daily, the koala needs to consume about 10 per cent of its body weight in leaves. To most animals, eucalypt leaves are poisonous but the koala has been equipped with special digestive adaptations to deal with the gum leaves.

In addition to a slow metabolic rate which allows koalas to keep food in their system for a long period of time, the marsupial also has a special intestinal chamber called the caecum.

Up to 2 m long, the caecum has millions of bacteria which ferment the leaves, making them easier to digest.

The word koala is derived from the Aboriginal term translated to "the animal that does not drink".

Koalas rarely need to drink because they absorb water from gum leaves. But the animal will drink water if necessary—for example, in times of drought.

Life Cycle

Female koalas, which can be identified by their white chests, weigh between 5kg and 9kg. They start breeding at about three or four years of age and usually produce only one offspring a year.

Male koalas range between 9kg and 14kg in weight and can be identified by a large brown mark on the chest. This mark is a scent gland which the male koala uses to mark his territory.

The koala breeding season is from about September to March. During this time, the bellowing of a male koala trying to attract a mate is a common sound.

Fights for dominance occur between males, with the winner earning the right to mate with the females of the area.

The birth of a new baby, called a joey, happens just 35 days after conception. The little baby, which looks a squishy pink

jellybean, has no hair or ears and is blind.

The young are carried in the pouch for about the first six months, slowly growing and developing eyes, ears and fur before emerging from mum's cosy pouch weighing about 500g.

Before they are able to digest leaves, the joey consumes a special faecal matter that the mother produces called "pap".

Riding on its mother's back, the joey eventually learns to feed upon fresh leaves. It remains with its mum until the next joey appears out of the pouch the following breeding season.

Estimating the life span of the koala is dependent on where the animal lives. The average life span of an adult wild male is 10 years, but the average survival rate for those living near a highway or near human settlement is only about two or three years.

How They Live

Koalas are very territorial animals and live in complex social groups. Individual members of koala society live in their own "home range".

The home range is made up by a number of trees specific to living in and eating from. Homes ranges of individual koalas sometimes overlap with their neighbours. It is here that important social interaction between the marsupials takes place. A koala's home range is not often apparent to humans, but koalas know to whom each tree belongs.

Koala behaviour is very sedentary. A study conducted by Adelaide University found that on average each koala spent six minutes grooming, 43 minutes moving around, 2.5 hours feeding and 20.5 hours resting.

They spend most of their time high in the treetops to keep their distance from predators. They venture on to the ground only at night to move to alternative trees or find a mate.

Threats.

As with most native Australian animals, there are many threats to the long-term survival of the koala.

In SA, the koala is considered "rare", but today there is also a concern about an over-abundance of koalas on Kangaroo Island, where koalas did not exist before human introduction. But it is important to remember that where there is an over-abundance of koalas, there is usually a scarcity of trees.

According to the Australian Koala Foundation, the national wild koala population has dropped to fewer than 100,000, compared with the millions that existed in the early-1900s before they were hunted for their fur.

Habitat loss, through land clearance for farms, towns and cities, remains one of the biggest threats to koalas.

Since European settlement, about 80 per cent of Australia's eucalypt forests have been destroyed.

Clearing these essential forests means all wildlife, including koalas, will not only suffer from habitat loss but also:

* Injury or death by traffic and introduced domestic animals.
* Effects of garden pesticides contaminating waterways.
* Increased competition for food and territory because of overcrowding.
* Increase in stress, making the koala more susceptible to disease.
* Bushfires and dieback—the gradual

death of trees because of a problem in the ecosystem.

What Can We Do to Help?

* *Keep your dog locked up—domestic animals should be restrained at night so koalas can move about safely without being stressed or attacked.*
* *Be alert when driving—the koala is most active during the night, so drive carefully and pay attention in areas marked with koala signposts.*
* *Keep swimming pool gates closed at all times—koalas are excellent swimmers, but can drown if they cannot climb out. A sturdy rope dangling in the pool can assist water-loving koalas. The chemicals in pools are also bad for koalas.*
* *Sick or injured koalas require specialised care. If you find an injured koala, contact: Cleland Wildlife Park on (08)8339 2444, Belair National Park on (08)8278 5477 or Black Hill Conservation Park on (08)8336 0901.*

While the future of the koala may appear grim, there are many groups around Australia helping to ensure the species survives for future generations. Many groups are fighting to prevent the destruction of habitat and are taking care of sick, injured or orphaned koalas so they can be released into the wild.

You can help the koala cause by being vigilant in your local area. When a development is planned in a koala habitat, voice your concerns with your local, state and federal politicians. For more information on how you can help koalas, contact the Australian Koala Foundation on www.savethekoala.com.

Survey

To help increase their knowledge about koalas in SA, Cleland Wildlife Park conducted a survey last month. Residents of the Adelaide Hills, Friends of National Parks and school students spent the weekend of July 27—29 observing and documenting koala numbers and behaviour around the state.

Initial results have already provided important information, including:

* *The sighting of 137 koalas from Clarendon and Happy Valley in the south, to Tea Tree Gully and Woodforde in the north.*
* *Of the 416 sighted over the past six months in SA, 99 were in suburban backyards, 75 on rural properties, 44 in roadside vegetation, 93 in parks and reserves, 246 up trees, 35 on the ground and eight on roads.*

The information collected will be used in conjunction with future surveys to analyse the trends and changes in koala numbers over time.

Did You Know

* *The koala can eat about 10 per cent of its body weight in leaves a day.*
* *The koala's climbing strength comes from its thigh muscle which is joined to the shin much lower than in other animals.*
* *The koala's digestive system can deal with toxic compounds in eucalypt leaves.*
* *A swimmer, the koala is able to cross rivers. Road kills are one of the greatest causes of koala death.*

The Advertiser wishes to thank the Australian Koala Foundation, Cleland Wildlife Park and the Adelaide Zoo for help with the text.v



参考译文

在澳大利亚的4个州：南澳大利亚州、新南威尔士州、维多利亚州和昆士兰州都可以看见考拉(树袋熊)的踪影。但是考拉的分布情况依赖于栖息环境的稳定性。

如今，考拉喜欢栖息在沿海或内陆的森林里。

人们相信早在几千年前，考拉的祖先可能已经生活在雨林里了。

考拉这种有袋目动物只有生活在有喜爱的树种并且周围有其他同类时，其数量才会比较稳定。历史上记载，只有在南澳大利亚州的东南部才存在考拉，但是，20世纪20年代早期由于人类的猎捕，这里的考拉灭绝了。

然而，在20世纪20年代到60年代之间，该州又从维多利亚州引进了考拉，试图保护这个物种。于是南澳大利亚州考拉的数量又渐渐多了起来。

在南澳大利亚州，考拉主要生活在阿得莱德山及其丘陵地带、洛夫蒂岭山和袋鼠岛上，在艾尔半岛和河地也有一些零散的分布。

据澳洲考拉保护协会估计，南澳大利亚州和维多利亚州的野生考拉总共达到1万到1.5万只。

考拉是树栖动物——即它们是生活在树上的且非常适应树上的生活。

除了具有极佳的平衡感，考拉还有粗厚的掌垫和趾垫，前掌有5个手指，其中2个拇指与其他3指相对，这使得它在攀爬时能够更有力地握紧物体。

就像许多的澳大利亚本土动物一样，考拉喜欢在夜间活动，日落之后正是它们最活跃的时候。

考拉身上长着厚厚的几乎像羊毛一样的皮毛，这层皮毛有助于它们抗热防寒。考拉臂部有一个坚实的底盘(它的尾巴经过漫长的岁月已经退化成一个“坐垫”)，这让它坐在树杈上时更舒服。

考拉靠采食桉树叶为生。尽管澳大利亚全国范围内有600多种桉树，但考拉这种有袋目动物却只食其中的20~30种桉树的叶子。每天，考拉需要进食的桉树叶的量是它体重的10%。对于大多数的动物来说，桉树叶是有毒的，但是考拉拥有特殊的消化系统能够消化这些有毒的树胶叶。

除了缓慢的新陈代谢使食物能够在体内停留较长时间外，这种有袋目动物还有一个特殊的肠腔，叫做盲肠。

这个盲肠长达2米，里面有数以万计的微生物，这些微生物使树叶发酵从而使食物更加容易消化。

考拉几乎不需要喝水，因为它们从桉树叶里吸收了水分。但是必要的话，它们还是要喝水，比如在干旱时期。

雌性考拉的特征是胸口有白色的皮毛，体重在5~9公斤。它们会在3~4岁的时候开始繁殖后代，而且通常一年只生育一个后代。

雄性考拉的体重在9~14公斤之间，特征是胸前有一大片醒目的棕色皮毛——这是一个气味腺，雄性考拉用它分泌气味来标明自己的领土范围。

9月至次年的3月是考拉的繁殖期。在这个期间，雄性考拉通常会发出高亢的吼叫试图吸引配偶的注意力，这个吼声在繁殖期间是非常普遍的声音。

雄性考拉势力之间相互争斗，胜利者赢得和该地区的雌性考拉交配的权利。

新出生的幼崽，也就是小考拉在雌性考拉受孕35天后就出生了。这个小家伙，看起来就像是一颗湿软的粉红色软心豆粒糖，它没有毛发，没有耳朵，而且也看不见。

在最初的6个月里，小考拉是呆在育儿袋里的，在那里它的眼睛、耳朵和皮毛都慢慢地发育成熟，然后它就能从母亲舒适的育儿袋里探出头来了，此时的它体重大约有500克。

在幼崽有能力消化树叶之前，它们靠从母兽那里摄取一种特殊的排泄物——“半流质食物”来维持生命。

最终，骑在母亲背上的小考拉最终学会以新鲜树叶为食。它会继续与母亲一起生活，直至下个繁殖期雌性考拉的下一个幼崽出生为止。

考拉的寿命取决于它们生活的环境。一只成年野生雄性考拉的平均寿命是10年，但是如果是一只生活在高速公路旁或人类居住地旁的考拉的话，它的平均寿命就只有2~3年。

和其他的澳大利亚本土动物一样，这里对于考拉的长期生存存在很多威胁。

在南澳大利亚州，考拉极为稀少，而在袋鼠岛上，考拉的数量则过多，这也引起了广泛关注。在人工引进考拉之前，袋鼠岛上是没有考拉的。但要知道重要的一点是，哪里的考拉过多，哪里的树木就会非常稀少。

澳洲考拉保护协会指出，相对于20世纪早期澳大利亚野生动物考拉的数量达上百万只，而后因人类为获取它们的皮毛而大量捕杀考拉，到现在，全国范围内考拉的数量下降至不足十万只。

为了建立农场、乡镇和城市，人们开垦土地，从而导致了考拉栖息地的不断沦陷。这依然是考拉生存的最大威胁之一。

自从欧洲人来澳洲大陆定居之后，有80%的桉树林遭到了破坏。

破坏这些重要的树林意味着对包括考拉在内的所有生物来说，不仅仅是栖息地的丧失，而且还意味着：

* 被交通工具或家养动物伤害或致死。
* 水源受到菜园农药污染。
* 由于过于拥挤造成食物和空间竞争加剧。
* 压力过大使得考拉更容易生病。
* 林区大火和树木疫病——因为生态系统的某些问题，树木逐渐死亡。

尽管考拉未来似乎要面临严峻的形势，但是，澳大利亚国内有很多组织都在尽力帮助这个物种，以使这个物种在未来可以延续下去。很多机构正在为了阻止对考拉栖息地的破坏而奋斗，同时他们还照顾生病、受伤或者失去双亲的考拉，使它们有一天能够重回大自然的怀抱。

核心词汇

koala [kəu'ɑ:lə] *n.* 考拉
habitat ['hæbitæt] *n.* 栖息地，居留地
coastal ['kəustl] *adj.* 海岸的
marsupial [mɑ:'sju:pjəl] *n.* 有袋目类
scatter ['skætə] *vt.* 散布，零落地出现
fork [fɔ:k] *n.* 叉
eucalypt ['ju:kəlipt] *n.* 桉树
intestinal [in'testinl] *adj.* 肠的
chamber ['tʃeimbə] *n.* 膛
caecum ['si:dəm] *n.* 盲肠
territory ['teritəri] *n.* 领域，领土
bellowing ['beləuiŋ] *n.* 怒吼，吼叫
squishy ['skwiʃi] *n.* 湿软的，湿润的
cosy ['kəuzi] *adj.* 舒适的，惬意的
pouch [pautʃ] *n.* 小袋
faecal ['fi:kəl] *adj.* 排泄物的
pap [pæp] *n.* 半流质食物
joey ['dʒəui] *n.* 幼兽
over-abundance [əuvə,ə'bʌndəns] *n.* 过剩
scarcity ['skεəsiti] *n.* 缺乏，不足
wildlife ['waildlaif] *n.* 野生动物
contaminate [kən'tæmineit] *vt.* 弄脏，污染
dieback [dai'bæk] *n.* 枯死
grim [grim] *adj.* 残忍的
orphan ['ɔ:fən] *vt.* 使……成孤儿

Bananas
13.话香蕉

机经选粹

这一篇讲的是香蕉种植及其历史。

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Bananas

The botanical names for the banana (Musa) come from the Sanskrit "moca", but does not seem to have attained its latinized name until the Middle Ages when the Arabic "mauz" was first used in the 13th century. The old specific name sapientium (means 'banana of the sages') had its origin in a legend recounted by a classical writer. Theophrastus told of three wise men who sat in the shade of a banana tree and ate its fruit. The name was then reserved for those sweet bananas eaten raw. Plantains or cooking bananas were assigned to Musa paradisiaca, which came about as a result of another legend of East Indian origin, where the banana was the fruit referred to as the Tree of Knowledge of Good and Evil in "paradise". There is a theory that it was a banana leaf that covered Adam's modesty and would surely have done so more effectively than a fig leaf.

The banana tree looks like a palm, but is actually an enormous herb with elongated fan-like leaves that can grow to over three meters in length. It grows a completely new "trunk" every year and dies back to its roots after it has flowered and fruited. This is remarkable, considering some kinds grow to heights of forty feet. The trunk is composed of overlapping bases of leaves wrapped tightly to make a fairly rigid column. New leaves constantly emerge at the top, forming a crown of leaves which are blown into tattered strips by the wind. This lowers the wind resistance because their "trunks" are not real trunks and, therefore, not as strong, and could easily be blown down.

Eventually, a stem emerges at the top, bearing a large flower surrounded by red bracts. The bananas develop a little distance away from the flowering tip of the stem into clusters called "hands" that contain up

to 200 bananas and point upwards through the leaves. Bananas start off growing downward, but then turn toward the light causing their tips to bend upward. This and their increasing weight cause the stem to bend over so that the fruits point upward, explaining why the banana has a slightly curved shape. The "hands"are comprised of ten to twenty bananas set in a double row in a half-spiral around the stem. There may be up to fifteen hands in a complete bunch which can weigh up to ninety pounds or more. Banana plants are propagated by replanting sections of the underground roots or budding stems. Growing rapidly, they produce beautiful red, yellow, and black flowers within a year.

Bananas are not left to ripen on the tree because they would soon split open and become infested with insects. Therefore, they are picked when two-thirds ripe and continue to ripen during shipment. The ripening process involves a chemical change in which protopectin is converted to soluble pectin, and starch is converted to sugars of 66% sucrose, 14% fructose, and 20% glucose. As the banana ripens, it gives off ethylene gas which, not only causes ripening, but the development of colour as well. Most fruits do this, but bananas give off an exceptionally large amount, so much so that they are able to help other nearby fruits to ripen. A ripening banana put into a closed container with green tomatoes will turn them red in a very short period of time or help an avocado ripen overnight.

Although bananas originated in Southeast Asia, they have grown in the tropics since ancient times. Before they were cultivated, bananas contained so many bitter black seeds that they were almost inedible. Today, there are more than 300 varieties of bananas that flourish in tropical regions, ranging from the sweet yellow pygmy fruit to the large fibrous plantains used only for cooking. The flowers of the wild banana of the Malaysian/Indonesian region, Musa acuminata, often fails to be fertilized in order to produce reasonable fruits. This wild plant, sometimes known as the monkey banana, must have been used for food since the earliest of times. At some point in the prehistoric era, cultivation began and growers encouraged varieties, with the least tendency to produce seeds. However, before the plant was driven into complete sterility, it crossed with an inedible wild species, *M. balbisiana*. The resulting hybrid bore almost seedless fruits of a superior quality and improved descendants of both *M. acuminata* and the hybrid. This forms the majority of the cultivated bananas today. Botanists classified bananas of this group as Eumusa (good banana) cultivars.

The earliest written record of their cultivation is of a 6th century BCE East Indian origin and did not reach China until about 200 CE, as mentioned in the works of Yang Fu. By the T'ang dynasty (618—907), it was already well-established, but grown only in the south, and considered a rare and exotic fruit in the north.

This attitude lasted into the 20th century as the following story of the nationalist wars of the 1930s shows. The northern Manchurian warlord, Wu Chüsheng, had been invited to Peking to attend a banquet. At the end of the meal, a bowl of fresh fruit was set in front of

him; and he selected a banana and ate it, peel and all. His host, wishing to offer a tactful hint, also took a banana and conspicuously peeled it before eating it. Wu, now aware of his error but not wanting to lose face, took a second banana and said that he always ate these things with their peel on, and he took another and ate it the same way.

The banana was brought to the attention of the Greeks in the 4th century BCE when the army of Alexander the Great encountered the tree in India in 327; and by the common era, the banana was cultivated in much of the eastern Mediterranean area. During the thousand-year history of the Byzantine Empire, bananas were favoured as the chief ingredient in desserts, served with honey, nuts, and various other fruits. Bananas were already growing extensively in equatorial Africa when the Portuguese arrived in 1498, likely having been introduced centuries before by Arab traders who brought them from India. It is alleged that banana plants were taken from the Canary Islands to the island of Hispanola in the West Indies by Tomas de Berlanga in 1516 and, soon after, to Mexico and Central America. However, banana leaves were found in Incan tombs predating the Spanish conquest of the area. In addition, Las Casas, a member of Columbus's fourth expedition (1503), mentions bananas growing in Costa Rica, together with pineapples and coconuts. Thus, it is quite possible that the banana plant was taken to South America by South Pacific migrants long before the Spanish introduction of them to certain areas.

The Spanish did introduce the banana plant to southern California, where Captain George Vancouver found them thriving during his visit in 1793. Today, huge plantations are found throughout Central America, northern South America, the West Indies, and Hawaii, supplying much of the Western World's demand. During the first millennium CE, the banana reached Africa, probably from Malay region to Madagascar. By the end of the 14th century, the fruit was being cultivated across the continent to the west coast. The Arabs spread cultivation through their lands south of the Mediterranean before 650 CE, but no further north than Egypt. Since the climate in southern Europe is too cool for the plant, the banana remained unknown to most Europeans until the early 1400s when Portuguese sailors found it in West Africa and took it to the Canary Islands, where it remains an important growing area. This may explain why the European name "banana" comes from a West African word, "banema" or "banana". In 1516, a Spanish missionary took banana roots with him from the Canaries to the West Indies, and then onto Panama, finally reaching the American mainland. Other missionaries followed his example, and the new plant quickly spread through Central America and the northern parts of South America. For some reason, the Spaniards saw a likeness between the banana tree and a totally different tree (plateno), which is how plantain obtained its confusing name.

In their native Asia, bananas are among the oldest cultivated plants; but they are known to the West only since 1885 when the occasional small consignments of bananas were sent by fast ships from the Canaries to Europe and from Cuba to the US. Con-



sidered an expensive luxury item, early varieties had not been bred for their keeping qualities, so the fruit had to arrive in just over two weeks. Two Americans are credited with introducing an expensive fruit to other lands on a regular basis. Captain Lorenzo Baker and Minor Keith, who independently in 1870 and 1872 began to ship bananas from the Caribbean to New Orleans, Boston, and New York. They also set up plantations and began an international banana trade. In 1899, they merged their interests to form the United Fruit Company which had, and still has, great influence in Central America and the islands. It is also the reason that these producing countries became known as the "banana republics". Other companies soon followed their lead, and West Indian bananas began appearing in Europe. When consumers saw the big yellow Caribbean bananas, they quickly lost interest in the small brown Canary variety, despite their better flavour.

The principal aroma of bananas is caused by amyl acetate. They also contain tryptopha, an amino acid that is converted to serotonin, an inhibiting brain neurotransmitter which makes bananas a calming food. Bananas can also be an internal lubricator, and green ones are used as an astringent in the treatment of diarrhea and hemorrhoids. When fully ripe, they can be beneficial in the treatment of constipation and ulcers. Some native peoples rubbed banana peels on their skin problems. Modern research has since confirmed that rubbing banana peel on red, scaly patches of psoriasis can provide relief without the side effects of conventional remedies. The active ingredients in banana peels, called esterified fatty acids, have been isolated and incorporated into a patented lotion (Exorex lotion) and sold commercially.

Bananas are rich in potassium, riboflavin, niacin, and dietary fiber. They also contain Vitamins A and C, B6, some calcium, iron, and magnesium. Because of their sweetness, they have a high energy value, making them a good supplement for active people. They have long been a natural cure to help replenish lost potassium during bouts of diarrhea or vomiting. Bananas are low in sodium and contain small quantities of the indigestible fibers cellulose, hemicellulose, and lignin, with moderate amounts of pectin, the food fiber that prevents the absorption of fats and may help lower blood cholesterol levels. Because of this trait, foods containing pectin should not be eaten at the same time as the consumption of essential fatty acids, which the body requires.

A banana begins with more starch than sugar; but as the fruit ripens, that role is reversed. Eating unripe bananas can be harmful because they contain proteins that inhibit amylase, an enzyme that digests complex carbohydrates. Ripe bananas can be stored in the fridge. The cold air will slow the natural enzyme action that ripens the fruit, eventually rotting it. Cold storage will darken the banana's skin caused by the damaged cells in the skin to release polyphenoloxidase, an enzyme that converts phenols to dark brown compounds. The fruit inside, however, will remain tasty for several days. For a quick "banana ice cream", bananas can be frozen in their skins, then quickly peeled and eaten immediately before they turns mushy. Using bananas

this way in a blender drink is also excellent. Overripe bananas need not be thrown out. They make excellent additions to banana bread or pancakes.

Other forms include dried bananas, whose natural sweetness is intensified, and canned bananas, which are generally packed in a heavy syrup. Raw bananas can be used in a variety of ways, including drinks, ice creams, and in salads. In Indonesia and the Far East, bananas are served as an accompaniment to such rice dishes as nasi goreng and curries. They combine well with other tropical fruits, and can be baked in their skins. Banana buds or flowers are used as a vegetable, but must be properly prepared first. Each capsule contains a female, neuter, and male flower part; and each opens up into a banana, except one, the large terminal bud that hangs down from the ripening bunch of bananas. It is this all-male flower that is served up as a vegetable. The bud looks like a "maroon torpedo", about ten inches long. To make it edible, one has to be ruthless in its cleaning, much like an artichoke.

On the flip-side, bananas can interfere with the action of some drugs, especially in those taking MAO inhibitors (monoamine oxidase), which are used as antidepressants or antihypertensives. They inhibit the action of enzymes that break down the amino acid tyramine so it can be eliminated from the body. Tyramine is a pressor amine, a chemical that constricts blood vessels and raises blood pressure. By eating such a food as a banana that contains tyramine, while taking an MAO inhibitor, the pressor amine cannot be eliminated; and the result can be abnormally high blood pressure or a hypertensive crisis.

Bananas can also create a false-positive for tumors. Carcinoid tumors can arise from tissues in the endocrine system, the intestines, or the lungs. These tumors secrete serotonin, a natural chemical that makes blood vessels expand or contract. Because seratonin is excreted in the urine, these tumors are diagnosed by measuring the levels of seratonin by-products in the urine. Bananas contain large amounts of seratonin, and eating them three days before an endocrine tumor test can produce a result that will suggest the presence of a tumor that is really not there. Other such foods that can create a similar false-positive tumor test are avocadoes, eggplant, pineapples, plums, tomatoes, and walnuts.

Some types of bananas include the following:

Cavendish is known as the dessert banana, and is the most common and widely available. Such varieties of sweet banana are the long, curved fruit which develop a speckled brown skin as they ripen. Cavendish bananas are of southern Chinese origin and a top commercial variety. The most popular cultivar is Dwarf Cavendish. It is not named for its size, but for its short growing stem. This variety is able to tolerate cooler climates better than other bananas. The Canary banana is a subvariety of Dwarf Cavendish. Cavendish bananas are shorter, blunter, duller coloured, and with thinner skin than the Gros Michel. The flavour of most kinds is

better, and they are preferred in Asia.

Lady finger or Sugar are tiny finger bananas often no more than three inches long. They have a creamy flesh and a very sweet flavour. They are also known as Baby Bananas, Mysore, Ninos, dwarf, and Chicaditas, and are a favourite of children. They are smaller than a Cavendish and considerably sweeter, with a denser texture.

Lemon bananas or Burro bananas are small, chunky bananas grown in Mexico that have a faint lemon flavour.

Apple bananas or Manzanos are also a small yellow banana that has golden flesh and, when very ripe, a faint taste and aroma of an apple or strawberries. They are not as sweet as regular bananas and about half the size.

Red bananas (also known as red Cubans or Colorados) are from Ecuador. They have brownish-red skins and smooth, yellowish-pink, sweet flesh with a creamy texture. Their colour makes it hard to assess the exact degree of ripeness, so they can sometimes prove disappointing. They are ripe when a few blackish patches develop on the skin.

Green bananas are large and suitable only for cooking. Their crisp flesh makes them a good substitute for potatoes, although their flavour is blander. Fried green bananas are very good in curries.

Gros Michel is the big familiar, top commercial, yellow eating banana. Its thick skin and reliable quality make it ideal for shipping long distances, and has long been grown in Southeast Asia and Sri Lanka. It was introduced to the West Indies in 1835, and soon became the dominant variety called the Jamaican banana.

Lacatan is another export variety, very similar to the export types of Dwarf Cavendish. In the Philippines, they are known as the Lakatan and is regarded as the best banana in the world. It is highly aromatic and its pulp is sweet, firm, and light orange-yellow when ripe.

Other varieties, including some very good ones, are only eaten in the area where they are grown because their skins are too thin or their lives are to short to permit export, except by air as a luxury item. Among these is the silk banana, grown in tropical regions worldwide. In the French West Indies, names for a particular banana are used that mean plum, fig, or pineapple fig; but that banana has very white flesh and a sweet, but sharp taste. A similar variety is the lady's finger or apple banana. A small, thin-skinned deep yellow banana of bulbous shape is called "sucrier" or bird's fig in the West Indies and "pisang mas" (golden banana) in Malaysia and Indonesia. It is a major variety in New Guinea, and is known in the Philippines. The Mysore banana grows well in poor soil and is often cultivated in the more barren parts of Asia, and is a quite good eating variety. In both Asia and the West Indies, there are several kinds of red bananas, sometimes having a green stripe and pink flesh. They are delicious, but frail and shortlived. A few are exported to the US.

参考译文

香蕉树外形很像棕榈树，但它实际上是一种长着扇形叶子的大型草本植物，它的叶子能长到3米多长。每年，香蕉树都会长出一个全新的“躯干”，然后等它开花结果之后，整个植株就会彻底地枯萎。即便是这样，有些树还能可以长到40英尺高，这真是不可思议。树干是由重叠的叶子组成，这些叶子层层地紧密包裹成一个相当坚硬的“躯干”。香蕉树顶部不断长出新叶子，形成了一个叶冠。这些叶子都被风吹成一条一条的了，这就降低了抵抗风的能力，因为香蕉树所谓的“树干”不是真正的树干，所以并没有那么坚固，也就很容易会被吹倒了。

最后，树顶长出一个茎，上面开出一朵被红色苞叶环绕的大花。香蕉从茎上开花的顶部的不远处开始生长，长出一串串包含多达200根的香蕉，并穿过树叶成为指向上的“手”。香蕉开始时是朝下生长的，而后朝阳生长，致使它们的顶部向上弯曲。这与它们不断增加的重量一起共同导致了茎的弯曲，于是香蕉的一端就会朝上生长，这些也就解释了为什么香蕉的形状是略显弧形。那些“手”由10~20根香蕉组成，这些香蕉分两排呈半螺旋状长在躯干周围。完整的一串香蕉可能有多达15只“手”，重达90多磅。香蕉的植株是通过移植部分地下根和发芽的茎来进行繁殖的。这些根茎生长得很快，一年之内它们就会开出红色、黄色和黑色的美丽花朵。

不能留香蕉在树上成熟，因为熟了之后它们很快就会裂开，然后招引昆虫。所以，当它们有六七成熟的时候就要摘下来，然后让它们在运输的过程中继续成熟。香蕉成熟的过程涉及一个由原果胶转变成可溶性果胶，淀粉转化成糖分——66%的蔗糖、14%的果糖和20%的葡萄糖的化学过程。香蕉在成熟过程中会释放出一种叫乙烯的气体，这种气体不仅会加快成熟，而且也会使果实颜色发生变化。大部分水果都会这样，但香蕉释放出的乙烯气体的量格外大，以至于可以使它附近的水果也加快成熟。把一根成熟了的香蕉放到一个装有青西红柿的密封装置中时，这些西红柿在很短的时间内就会变红，而且香蕉还可以让鳄梨在一夜之间成熟。

虽然香蕉起源于东南亚，但是从古代以来，它们就生长在热带地区。在香蕉被人工种植之前，它果实里面有很多几乎是不能食用的黑色苦籽。而如今，从香甜的黄色小香蕉到只用于烹饪的巨大的纤维大蕉，热带地区茂盛地生长了300多种不同种类的香蕉。马来西亚/印度尼西亚地区野生香蕉——尖叶蕉，它们的花朵为了长出正常的果实经常不能受粉。这种野生植物，有时也被称为“猴子香蕉”，从很早的时候起，它就一定已被食用。在史前某个时刻，人们开始种植香蕉，种植者们开发了多个种类尝试培育无籽的香蕉。然而，在人类使尖叶蕉完全不结种子之前，这个未改良好的杂交品种和一个不宜食用的野生种类——长梗蕉进行了杂交。结果，这次杂交结出了品质优良的几乎无籽的果实，改良了尖叶蕉和那个杂交品种的后代。这形成了现在种植的香蕉的大部分。植物学家们把这类香蕉归类为真蕉亚属(好香蕉)品种。

正如杨孚的著作中提到的，香蕉的种植最早起源于公元前6世纪的东印度，而直到公元200年才传到中国。到了唐朝(公

元618—907年)，香蕉种植已经发展得很好了，但是却只在南方种植，对于北方而言它还是一种稀有的异域水果。

公元前327年，亚历山大大帝的军队在印度看到香蕉树，于是在公元前4世纪的时候香蕉就受到了希腊人的关注；在这个时代之前，地中海东部的大部分地区就已种植了香蕉。在有千年历史的拜占庭帝国时期，香蕉作为甜点的主要原料很受喜爱，与蜂蜜、坚果和其他各式各样的水果一起供人享用。1498年，当葡萄牙人到达赤道附近的非洲时，香蕉已经在那里广泛种植了，可能是几百年前由阿拉伯商人从印度带过来的。据说，香蕉是托马斯·德·博兰加1516年从加那利群岛带到西印度群岛的伊斯帕尼奥拉岛上去的，之后不久又被他带到了墨西哥和中美洲。然而，在印加陵墓发现的香蕉叶子似乎将西班牙征服该地区的日期提前了。另外，哥伦布第四次远航的一位成员拉斯·巴托洛米奥提到和菠萝、椰子一起种植在哥斯达黎加的香蕉。因此，极有可能在西班牙人把香蕉引进到某些地区之前很久，香蕉就已经被南太平洋的移民带到南美洲去了。

香蕉富含钾、核黄素、烟酸和食用纤维，还含有维他命A、维他命C、维他命B6，以及一些钙、铁和镁。因为香蕉很甜，所含能量就很高，这使得香蕉为剧烈运动的人们提供很好的能量补充。长时间以来，香蕉就是一种天然药物，可以用来补充因拉肚子或者呕吐而流失的钾。香蕉的钠含量低，并且含有少量的难消化的纤维素、半纤维素和木质素，它还含有适量的果胶，果胶是能够防止脂肪吸收的食物纤维，有助于降低血的总胆固醇水平。因为这一特性，人在摄入人体所需必要的脂肪酸的同时不能食用含果胶的食物。

核心词汇

banana [bə'nɑ:nə] *n.* 香蕉
elongated ['i:lɔŋgeitid] *adj.* 细长的，拉长的
surround [sə'raund] *vt.* 包围，环绕
weigh [wei] *vt.* 秤重量，衡量
shipment ['ʃipmənt] *n.* 装船，出货
ethylene ['eθili:n] *n.* 乙烯
ripening ['raipəniŋ] *adj.* 成熟的
avocado [ævə'kɑ:dəu] *n.* 鳄梨
tropic ['trɔpik] *n.* 热带
inedible [in'edibl] *adj.* 不适于食用的，不能吃的
tendency ['tendənsi] *n.* 趋势，倾向
sterility [ste'riliti] *n.* 不生育，不结果
seedless [seedless] *adj.* 无核的，无籽的
hybrid ['haibrid] *n.* 杂种，混合物
cultivar ['kʌltivɑ:] *n.* 栽培变种，培育植物
dynasty ['dainæsti] *n.* 朝代，王朝
exotic [ig'zɔtik] *adj.* 异国的，外来的
equatorial [ˌekwə'tɔ:riəl] *adj.* 近赤道的，赤道的
migrant ['maigrənt] *n.* 移居者
potassium [pə'tæsjəm] *n.* 钾
riboflavin [ˌraibəu'fleivin] *n.* 核黄素
magnesium [mæg'ni:zjəm] *n.* 镁
cellulose ['seljuləus] *n.* 纤维素
hemicellulose [ˌhemi 'seljuləus] *n.* 半纤维素
fatty ['fæti] *adj.* 脂肪的，含脂肪的

Sea Otter Facts

14. 海獭轶事

机经选粹

这一篇是讲 otter(水獭)的，讲了他的一些外部特征、生活习性和对它的保护措施。

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Sea Otter Facts

Sea otters are members of the weasel family (Mustelidae) and are related to mink and river otters. Adult males weight 70 to 90 pounds with some individuals weighing 100 pounds. Females average 40 to 60 pounds. Adults reach a length of 4.5 feet. The hind feet are webbed and are adapted for swimming. The toes on the forefeet are short and stiff, enabling the animal to deftly handle food. On land their gait is clumsy. Probably because of this vulnerability, they are seldom found more than a few yards from water.

The fur, which is possibly the finest in the world, consists of a very dense underfur of inch-long fibers and sparse guard hairs. The underfur ranges from brown to almost black. Guard hairs may be black, pale brown, or silver, often giving a veiled effect of silvery hairs on a dark background. Older animals often develop a silvery head. This, combined with the prominent whiskers, leads to the nickname of "Old Man of the Sea."

Unlike seals, which rely on a heavy layer of blubber for protection against the cold North Pacific waters, sea otters depend on air trapped in their fur for maintaining body temperature. If the fur becomes soiled or matted by material such as oil, the insulation qualities are lost. This results in loss of body heat and eventual death. For this reason, otters spend much time grooming their fur to keep it clean.

Sea otters mate at all times of the year, and young may be born in any season. However, in Alaska most pups are born in late spring. Like other marine mammals, they have only one pup during each breeding cycle. A pup weighs 3 to 5 pounds at birth and is light brown in color. The female's maternal instinct is very strong and she seldom leaves her pup except when diving for food. When traveling, sleeping, or preening, the pup usually

rides its mother's chest as she floats on her back. The pup may weigh 30 pounds (14 kg) when weaned and looks almost as big as its mother. Females can produce one pup a year, but in areas where food is limited, they may produce pups every other year.

Sea otters usually do not migrate. They seldom travel far unless an area has become overpopulated and food is scarce. They are gregarious and may become concentrated in an area, sometimes resting in pods of fewer than 10 to more than 1,000 animals. Breeding males will drive nonbreeding males out of areas where females are concentrated. In some areas, the nonbreeding males will concentrate in "male areas" which are usually off exposed points of land where shallow water extends offshore. Bald eagles prey on newborn pups and killer whales may take a few adults, but predation is probably insignificant. Many sea otters live for 15 to 20 years.

Sea otters eat sea urchins, crabs, clams, mussels, octopus, other marine invertebrates, and fish. They usually dive to the bottom in 5 to 250 feet of water and return with several pieces of food, roll on their backs, place the food on their chests and eat it piece by piece using their forepaws and sometimes a rock to crack shells. In the wild, sea otters never eat on land.

The southern sea otter (Enhydra lutris nereis), the smallest of marine mammals, usually lives for 15 years and feeds primarily on a variety of large invertebrates, including sea urchins, abalone, rock crabs, kelp crabs, and clams. Their ability to use tools to break open their food makes them unique among marine mammals. Most adult female sea otters give birth to one pup each year. It was listed as threatened in 1977 under *the Endangered Species Act*, and as a depleted species under the *Marine Mammal Protection Act*.

Southern sea otters depend on clean, water-resistant fur (about one million hairs per square inch) for insulation against cold ocean water. Due to their small body size and lack of blubber, sea otters also stay warm by producing a high level of internal heat. To satisfy their high energy requirements, sea otters spend the majority of their time foraging for food and eat an average of 25% of their body weight each day.

The sea otter (Enhydra lutris) lives in shallow water areas along the shores of the North Pacific. Its range once extended from southern California north then west through the Aleutian Islands, to the Kamchatka Peninsula, and south to the northern islands of Japan. In 1742, Vitus Bering's men returned with sea otter pelts from the historic voyage of discovery of Alaska. Interest in these rich furs initiated an era of exploitation, which almost wiped out the sea otter.

Finally in 1911, when so few animals were left that it was no longer profitable to hunt them (in many areas they were completely exterminated), sea otters were given full protection under the *Fur Seal Treaty*. The treaty was signed by the United States, Great Britain, Russia, and Japan.

In 1960, the state of Alaska assumed management authority for sea otters. The management program conducted by the state included the successful reintroduction of sea otters to unoccupied habitat in Southeast Alaska, British Columbia, and Washington. The *Marine Mammal Protection Act* transferred management authority to the U.S. Fish and Wildlife Service in 1972. Recovery of the Alaska sea otter population has been dramatic. Perhaps as few as 2,000 total animals existed in 1911, but by the mid-1970s the Alaska population numbered between 110,000 and 160,000. Most of the sea otter habitat in Alaska has now been repopulated. The principal exception is Southeast Alaska where numbers are increasing rapidly and otters are moving into new areas. Smaller populations exist in the Commander and Kurile islands, British Columbia, Washington, and California.

参考译文

海獭属于鼬鼠科(鼬科)动物，与貂和河獭同属一科。成年雄海獭重70~90磅左右，有些能达到100磅。雌性海獭平均重40~60磅。成年海獭身高能达到4.5英尺。海獭后趾长有趾蹼，适于水中生活。前肢脚趾短而刚硬，便于灵巧地握住食物。在陆地上它们步态笨拙，可能是因为这个弱点，它们很少会被发现会在离水域几码之外的地方。

海獭的皮毛，可能是世界上最珍贵的，它由浓密的一英寸左右的细软纤维绒毛和稀疏的外层针毛组成。细软绒毛的颜色从棕色到几近黑色不等，外层针毛可以为黑色、浅褐色或银色，银色的毛通常在黑色皮毛的遮掩下产生忽隐忽现的神秘效果。年长一些的海獭的头部皮毛常会变成银白色。如此一来，再配上它们那卓尔不凡的胡须，故被冠以"海上老人"的昵称。

海獭不像海豹一样，有一层厚厚的皮下脂肪能抵御北太平洋水域的寒冷，它们是靠厚厚的皮毛所聚拢的空气来保持体温。如果皮毛因为沾染油等物质而变得脏乱或者缠结，就会失去绝缘功能，结果导致海獭身体热量散失而被冻死。基于此，海獭们花相当多的时间来梳理皮毛，以保持皮毛的清洁。

海獭在一年的任何时节都能交配，小海獭也可能在任何季节出生。然而在阿拉斯加，大部分幼崽都出生在暮春。跟其他海洋哺乳动物一样，海獭在一个繁殖周期内只产一只小海獭。幼崽出生时重3~5磅，皮毛呈浅褐色。雌海獭有很强的母性本能，除非要潜水觅食，否则她们绝不会离开幼崽。行走、睡觉或整理皮毛时，小海獭通常坐在妈妈胸前，妈妈仰身浮在水面上。断奶后，小海獭可长至30磅(14千克)，看起来几乎和妈妈一样大。雌海獭一年能生产一次，而在食源不充足的地方，每隔一年才生产一次。

海獭一般不会迁移。它们很少远行，除非所在区域的海獭数量过多或食物短缺。海獭属群居生活，通常会集中到一个区域，有时聚在一起休息，少则10多只，多则超过1,000只。处于繁殖期的雄海獭会将未处于繁殖期的雄海獭逐出雌海獭的聚居地。未处于繁殖期的雄海獭经常会远离近浅海滩等暴露的地方，形成"雄性领域"。新生的小海獭会成为秃鹰的食物，一些成年海獭也可能被鲸捕食，但是这些捕食行为也许是无足轻重的，许多海獭的寿命可达15~20年。

海獭以海胆、蟹、蛤蜊、贻贝、章鱼、其他海洋无脊椎动物以及鱼类为食。它们经常潜入水下5~250英尺深的海底，带回几样食物，然后翻滚脊背，把食物放在胸前，再用前爪一份份地享用，有时还会用石块砸碎贝壳。在野外，海獭从来不在陆地上进食。

南部地区的海獭(南海水獭)是海洋哺乳动物中体型最小的，寿命一般为15年，主要以各种大型海洋无脊椎动物为食，包括海胆、鲍鱼、岩石蟹、海草蟹、蛤蜊等。在海洋哺乳动物中，使用工具砸开食物的技能使这种海獭显得独一无二。大部分成年雌海獭每年产一只幼崽。1977年，它作为处于危险境地的物种被列入了《濒危物种法案》，也被《海洋哺乳动物保护法》列为濒危物种。

南部海獭用干净、防水的皮毛(每平方英寸约有100万根毛)来隔离冰冷的海水。因为体型小，缺少脂肪，海獭们也经常会在身体内部产生高热量来保暖。为了满足对高能量的需求，它们花了大部分的时间去搜寻食物，每天摄入的食物量平均占自己体重的25%。

这种海獭生活在北太平洋海岸的浅水水域。它们的生活范围曾经从南加利福尼亚北部，向西穿过阿留申群岛，延伸至堪察加半岛，向南延伸至日本列岛北部。1742年，威图斯·白凌的海员们从历史闻名的发现阿拉斯加的航海途中带回了海獭的皮毛。这些昂贵的皮毛带来的利润开创了航海历史上的新纪元，这几乎使海獭陷入绝境。

最终，在1911年，海獭数量已经很少，以至于人类已不能捕猎它们再从中获利(在很多地区已经完全灭绝了)，海獭在《皮毛保护条约》下得到了全面的保护，此条约是由美国、英国、俄国和日本签订的。

1960年，阿拉斯加州承担了海獭的管理权。引导海獭管理项目的州拥有能力把海獭成功再引入阿拉斯加东南部、英属哥伦比亚省和华盛顿州等未被开发的栖息地。1972年，《海洋哺乳动物保护法》将管理权移交至美国鱼类和野生动物管理局。阿拉斯加海獭数量开始急剧回升。1911年海獭的总量仅仅为2,000只，但是在20世纪70年代中期，阿拉斯加海獭数量已达11万~16万只。现在，阿拉斯加的大多数海獭栖息地都被重新住入。但在阿拉斯加东南部却是一个特例，在那里海獭的数量急剧上升，海獭们正在迁移到新的区域。而在司令群岛和库日勒岛群岛、英属哥伦比亚省、华盛顿和加利福尼亚州，海獭数量则相对要少一些。

核心词汇

weasel ['wi:zl] *n.* 鼬鼠，鼬科动物
mink [miŋk] *n.* 貂
individual [ˌindi'vidjuəl] *n.* 个体，个人
clumsy ['klʌmzi] *adj.* 笨拙的，笨重的
underfur ['ʌndəfə:] *n.* 细软绒毛
nickname ['nikneim] *n.* 昵称，绰号
layer ['leiə] *n.* 层
blubber ['blʌbə] *n.* 脂肪
soiled [sɔild] *adj.* 污染的
matted ['mætid] *adj.* 蓬乱的，不光滑的
eventual [i'ventjuəl] *adj.* 最终的
preen [pri:n] *vt.* 梳理羽毛
pup [pʌp] *n.* 小海獭，幼崽
gregarious [gre'gɛəriəs] *adj.* 社交的，群居的
newborn [nju:'bɔ:n] *adj.* 新生的
urchin ['ə:tʃin] *n.* 海胆
forage ['fɔridʒ] *vt.* 搜寻，掠夺
initiate [i'niʃieit] *vt.* 开创，发动
exploitation [ˌeksplɔi'teiʃən] *n.* 开发，利用，剥削
unoccupied ['ʌn'ɔkjupaid] *adj.* 未被开发的，未被占领的
principal ['prinsəp(ə)l] *adj.* 主要的

Twin Studies

15.双胞胎研究

机经选粹

这一篇是关于人类对双胞胎——Identical twin和non-idential twin的疾病研究。文中主要介绍在1950s之后对于twins的研究，以及一个Oiho的研究所的主要研究内容。



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Twin Studies

The scientific study of human twins began in the 1870s when Sir Francis Galton (1822—1911) published a series of articles arguing that heredity (nature) was a stronger factor than environment (nurture) in determining the respective characteristics of twins. He later suggested that identical twins might come from a single egg while non-identical twins might come from two separate eggs, simultaneously fertilized and implanted. This guess, published in *Inquiries into Human Faculty and its Development* (1883), was later proved correct, but neither Galton nor his contemporaries had any rigorous evidence to support it.

Human twin studies are important for genetic and psychological research because twins provide a natural control for experiments. Because respect for each twin's feelings, privacy, and personhood is easy for even the best-intentioned scientist to compromise, and because twin research readily evokes eugenics, some twin studies will probably always remain controversial, both ethically and scientifically.

Twin studies ramify into genetic, embryological, biochemical, immu-nological, behavioral, anthropological, psychological, and sociological aspects. Among the questions asked are: What genetic, biological, or environmental factors cause twinning? How do the inherited and acquired traits of twins differ from those of singletons? How do the traits of identical (monozygotic) twins differ from those of

non-identical (dizygotic) twins? Why and how does one twin typically dominate the other? What are the effects when monozygotic twins grow up apart? What are the effects of adoption?

American scientists such as Horatio Hackett Newman (b. 1875), Frank Nugent Freeman (b. 1880), and Karl John Holzinger (b. 1892) at the University of Chicago extended Galton's tradition of careful twin research. Their 1937 work, *Twins: A Study of Heredity and Environment*, is a landmark in the literature of nature versus nurture. In 1940, capitalizing on the widespread frenzy over the Dionne quintuplets (b. 1934), Newman wrote a semi-popular work, *Multiple Human Births: Twins, Triplets, Quadruplets, and Quintuplets*, speculating on the biological or genetic causes of their seemingly miraculous birth and survival.

Motivated primarily by eugenics, twin studies took a more sinister turn in Germany in the early twentieth century. Johannes Lange (1891—1938) argued that criminal propensities in one twin increased the likelihood of similar sociopathy in the other. His 1929 book, *Verbrechen als Schicksal: Studien an kriminellen Zwillingen* (Crime as Fate: Studies of Criminal Twins), was admired by the British eugenicist John Burdon Sanderson Haldane (1892—1964) and translated into English in 1930 by Haldane's wife, Charlotte (1894—1969), as ***Crime and Destiny***.

German studies of twins, heredity, and genetics in the 1930s became inseparable from the politics of race. In 1935, a wealthy Bavarian from a prominent family, a member of the Sturmabteilung (SA) received a Ph.D. in anthropology at the University of Munich with a dissertation entitled *Rassenmorphologische Untersuchungen des vorderen Unter-kieferabschnitts bei vier rassischen Gruppen* (Race-Morphological Investigations of Sections of the Anterior Lower Jaw in Four Racial Groups). He then enrolled at the University of Frankfurt Institute for Hereditary Biology and Racial Hygiene to study under Otmar Freiherr von Verschuer (1896—1969). He joined the Nazi party in 1937 and its Schutzstaffel (SS) in 1938. His second dissertation, *Sippenuntersuchungen bei Lippen-Kiefer-Gaumenspalte* (Genus Investigations on Cleft Lip, Jaw, and Palate) gained him an M.D. in 1938. As an officer in the medical corps of the Waffen SS on the Russian front, he was twice decorated for bravery, seriously wounded, sent home in 1942 to recover, then assigned to Auschwitz as camp physician, where he arrived on 30 May 1943. This Bavarian was Josef Mengele (1911—1979).

Mengele had a morbid and perverse fascination with twins, and saw in the concentration camp an endless supply of subjects for his experiments. Verschuer arranged for full funding of Mengele's research at Auschwitz, provided that Mengele would send the most significant data and specimens to Frankfurt. Mengele

arranged to be the camp's principal "selector" deciding who would die and who would live. He ordered all twins lives spared for his purpose of study.

Mengele's twin studies were marked by arbitrariness, cruelty, and lack of scientific rigor. His work was mostly random trial and error, without hypotheses. Among his obsessions was trying to change eye color to blue. These attempts would often result in pain, infection, or blindness among the subjects. Convinced that the inmates at Auschwitz were less than human, Mengele kept his subjects naked so that he could measure and observe them more easily. He would inject, bleed, dismember, irradiate, or transfuse his twins, expose them to diseases, or perform unconventional surgical procedures on them without anesthesia. Mengele often killed one or both twin, dissected the bodies, and sent the results to Verschuer. Mengele's experiments involved over 1,500 pairs of twins. Only about 200 of these twins survived.

After World War II, Mengele escaped to South America. In 1959, prompted by Jewish "Nazi hunters"West Germany issued a warrant for Mengele's arrest. The Universities of Munich and Frankfurt revoked his degrees in 1964. A surviving pair of "Mengele Twins," Eva and Miriam Mozes (b. 1935), founded the international support group C.A.N.D.L.E.S. (Children of Auschwitz Nazi Deadly Laboratory Experiments Survivors) in 1985.

Not all twin research is as inhumane, illogical, or useless as Verschuer's and Mengele's. Yet, because of Auschwitz, reasonable and legitimate twin researchers after World War II experienced some difficulty in restoring its domain of inquiry to the level of approval enjoyed in Galton's time. In 1951, Italian geneticist Luigi Gedda (1902—2000) published the first significant postwar work on twins, *Studio dei gemelli* (A Study of Twins), a large book that was partially translated into English in 1961 as *Twins in History and Science*. Twin research gained momentum in the 1960s as geneticists revived Newman's interest indiscovering the causes of higher-order multiple births.

In 2001, the leading scientific investigator of twins was Thomas Joseph Bouchard, Jr. (b. 1937), professor of psychology at the University of Minnesota and director of the Minnesota Center for Twin and Adoption Research. Beginning in 1990, his team published copiously on the results of the project they conducted from 1979 to 1999, the Minnesota Study of Twins Reared Apart, wherein they periodically administered batteries of psychological, educational, medical, and dental tests to a large population of monozygotic and dizygotic twins and their spouses. Data was collected and maintained by the Minnesota Twins Registry. From 1987 to 2001, the team did a longitudinal study on twin aging, using subjects between 24 and 66 years old at first appointment.





对人类双胞胎的科学研究始于19世纪70年代，当时弗朗西斯·加顿先生(1822—1911年)发表了一系列文章，认为在决定双胞胎各自性格方面，遗传因素（天生）比环境因素（后天培育)更具有影响力。后来他提出，同卵双胞胎可能来自单个卵细胞，非同卵双胞胎可能来自两个不同的卵细胞，只是被同时受精和植入。这种猜测发表在《人类才能及其发展的探究》(1883)上，后来被证明是正确的，但在当时无论是加顿还是与他同时代的人都没有任何严格的证据来证明这个猜测。

人类双胞胎的研究对遗传和心理的探索具有重要意义，因为它使实验在自然状态下受到控制。因为出于对每一对双胞胎的感情、隐私和人格的尊重，即使是用意最好的科学家，都很容易妥协，并且由于双胞胎的研究容易促进优生学的发展，所以某些研究无论是从道德上还是科学上都可能一直会颇受争议。

与双胞胎研究有关的学术分支有遗传学、胚胎学、生物化学、免疫学、行为学、人类学、心理学和社会学等方面。其中有待回答的问题是：什么样的遗传、生物或环境因素促进双胞胎的形成？普通双胞胎遗传继承和后天习得的特性与这些单卵细胞发育胚胎有何不同？这些同卵双胞胎与异卵双胞胎的特性是怎么产生差异的？为什么双胞胎之一明显占主导地位并且他\她是如何做到的？分开养育的同卵双胞胎长大后有什么差异？收养他们会造成什么影响？

美国科学家如芝加哥大学的霍拉蒂奥·哈克·特纽曼(1875)、弗兰克·纽根特·弗里曼(1880)和卡尔·约翰·霍尔金格(1892)对加顿一向谨慎的双胞胎实验进行了延伸。他们1937年的著作《双胞胎：遗传和环境研究》，是将自然遗传与后天培养相对比的一本划时代的著作。1940年，通过利用人们对狄翁五胞胎(1934)的广泛、狂热的关注，纽曼写了本比较受欢迎的书《多胞胎的出生：双胞胎、三胞胎、四胞胎、五胞胎》，猜测他们看似神奇的出生和生存在生物或遗传方面的原因。

主要受优生学的推动，在20世纪初的德国，对双胞胎的研究更倾向于探索较阴暗的一面。约翰内斯·兰格(1891—1938年)认为，双胞胎之一有犯罪倾向会增强另一个的类似反社会倾向。1929，他的一本著作《犯罪的命运：刑事双胞胎研究》，受到英国优生学家约翰·伯登·桑德森·霍尔丹(1892—1964年)的欣赏，并于1930年由霍尔丹的妻子夏洛特(1894—1969年)翻译成英文，名为《犯罪和命运》。

20世纪30年代，在德国，双胞胎研究、遗传及遗传学与种族政治变得不可分割。1935年，一位家境优越的巴伐利亚人——(纳粹德国的)冲锋队(SA)成员之一，获得慕尼黑大学人类学博士学位，其论文题目为Rassenmorphologische Untersuchungen des vorderen Unterkieferabschnitts bei vier rassischen Gruppen（《对早期四个种族群体的种族形态的调查》）。随后，他就读于法兰克福大学遗传生物学和

人种保健学院，在导师奥特马尔·冯·费许尔男爵(1896—1969年)的指导下进行研究。1937年，他加入了纳粹党，并于1938年加入纳粹的党卫军(SS)。他的第二篇论文Sippenuntersuchungen bei Lippen-Kiefer-Gaumenspalte(《关于唇裂、颚、腭的种类调查》)使他在1938年获得医学博士学位。作为在俄罗斯前线的一个党卫军医疗团军官，他曾因其英勇行为两次被授予奖章。由于受重伤，1942年他被送回家休养，并于1943年5月30日被派遣到奥斯威辛集中营作医生。这位巴伐利亚人就是约瑟夫·门格尔(1911—1979年)。

门格尔对双胞胎的研究有着一种病态的执着的痴迷，并且在集中营里有充足的研究对象可做实验。费许尔为门格尔在奥斯威辛集中营的研究准备了充足的资金，只要门格尔能拿出最有说服力的数据和标本送往法兰克福。对此，委任门格尔成为在奥斯威辛集中营的主要负责人，并赋予生杀予夺的大权——决定谁死谁活。他下命令让所有的双胞胎活着，以备他的研究所用。

门格尔的双胞胎研究以其任意性、残酷性以及缺乏科学严谨性而臭名昭著。他的大部分工作只是随意地反反复复的试验，而不是提出假设。而这种执着就是试图把眼睛的颜色改变成蓝色。这些试验往往会导致实验对象的眼睛疼痛、感染或失明。他使人错误地认为奥斯威辛集中营的囚犯是非人类的生物，为了便于他更容易地测量和观察，让这些实验对象全身赤裸。他给双胞胎注射、放血、肢解、照射或输液，让他们患病，或不用麻醉药就对他们施行非传统的外科手术。门格尔经常杀死双胞胎之一或者两个都杀死，解剖其尸体并将结果呈给费许尔。其实验涉及1500多对双胞胎。其中只有大约200对存活。

二战结束后，门格尔逃到南美洲。1959年，在犹太“纳粹追捕者”的激励下，西德发出逮捕门格尔的逮捕令。慕尼黑大学和法兰克福大学于1964年撤销了他的学位。在“门格尔双胞胎”（实验）中幸存的一对——艾娃和米瑞姆·莫泽斯(1935)，于1985年成立了国际支援小组C.A.N.D.L.E.S.(奥斯维辛集中营死亡实验幸存者)。

并不是所有双胞胎研究都像费许尔和门格尔实验一样，是不人道、不合逻辑或无用的。然而，由于奥斯威辛集中营的先例，二战结束后，进行合理合法的双胞胎实验的研究人员在要求恢复享有加顿时期的调查水准时受到一些阻碍。1951年，意大利遗传学家路易·吉打(1902—2000年)出版了自战后以来关于双胞胎的第一份重要著作Studio dei gemelli(《一对双胞胎的研究》)。1961年，这本厚重的书部分被翻译成英文，名为《历史上和科学上的双胞胎》。20世纪60年代，遗传学家使纽曼对于探究高阶多胞胎诞生的兴趣复苏，这使得双胞胎的研究取得了发展的势头。

2001年，双胞胎的主要科学调查人是小托马斯·约瑟夫·布沙尔(1937)，他是明尼苏达大学心理学教授兼明尼苏达州双胞胎和收养研究(Twin and Adoption Research)中心的主任。他的研究小组自1990年开始，详细地公布了他们在1979—1999年期间一直研究的有关这项试验的成果——明尼苏达对分开抚养的双胞胎进行的研究(Minnesota Study of Twins

Reared Apart)。期间定期地就其结果发表了大量的报告，其中，从心理、教育、医疗和牙科测试到同卵双生、二卵双生及他们的配偶进行了一系列的定期管理研究。数据由明尼苏达双胞胎登记处收集和保存。从1987—2001年，该团队对双胞胎老年化做了纵向研究，其最初接受委任的被试对象年纪在24和66岁之间。

核心词汇

heredity [hi'rediti] *n.* 遗传
implant [im'plɑ:nt] *vt.* 注入，嵌入
personhood ['pɜ:sənhud] *n.* 人格
compromise ['kɔmprəmaiz] *vt.* 妥协，让步
eugenics [ju:'dʒeniks] *n.* 优生学
ramify ['ræmifai] *vt.* (使)分支，(使)分叉
immunological [i.mju:n'lɔdʒikəl] *adj.* 免疫学的
singleton ['siŋgltən] *n.* 一个
monozygotic [.mɔnəzai'gɔtik] *adj.* 单卵的，单精合子的
frenzy ['frenzi] *n.* 狂暴，狂怒
quintuplet ['kwintjuplit] *n.* 五胞胎之一
dizygotic [.daizai'gɔtik] *adj.* 两合子的，两受精卵的
frenzy ['frenzi] *n.* 狂暴，狂怒
quintuplet ['kwintjuplit] *n.* 五胞胎之一
sociopathy ['səusiəupəθi] *n.* 社会病态
eugenicist [ju:'dʒenisist] *n.* 优生学家，提倡人种改良者
genetics [dʒi'netiks] *n.* 遗传学
inseparable [in'sepərəbl] *adj.* 不能分的
morphological [.mɔ:fə'lɔdʒikəl] *adj.* 形态学的
bravery ['breivəri] *n.* 勇敢
arbitrariness ['ɑ:bitrərinis] *n.* 任意，恣意
dismember [dis'membə] *vt.* 肢解，分割
transfuse [træns'fju:z] *vt.* 移注，输血
anesthesia [.ænis'θi:zjə] *n.* 麻醉
warrant ['wɔrənt] *n.* 委任状，授权
inhumane [.inhju(:)'mein] *adj.* 无人情味的，残忍的
copiously ['kəupjəsli] *adv.* 丰富地，充裕地
dizygotic [.daizai'gɔtik] *adj.* 两合子的，两个受精卵的

Race is on to Save the Leatherback Turtle

16. 种族延续帮助挽救棱皮龟

机经选粹

这一篇讲的是关于棱皮龟的研究。对这种海龟的研究从发现它的尸体引入话题，提出为什么本不属于这里的海龟死在这里的问题，接着说这种海龟的生活习性——生活在深海，很难研究，只有雌龟要生蛋才会登陆上岸。对此，研究人员开始展开研究。

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Race is on to Save the Leatherback Turtle

The ancient Pacific leatherback faces extinction. So experts have found a novel way to generate interest in the plight of this mighty creature and its annual odyssey, reports Peter Popham.

What is it about the word turtle? Why must a fatally outdated style of knitwear, one of America's corniest Sixties pop groups and a dire children's cartoon series all cluster round this innocuous word? The clumsiest thing you can do in a boat is turn turtle. The turtle itself invariably cuts a ridiculous figure, with its hapless looking flippers, its armour-plated clumsiness, the gently extra-terrestrial contours of its skull, its famous sex drive... "The turtle lives' twixt plated decks, Which practically conceal its sex. I think it clever of the turtle in such a fix to be so fertile," wrote Ogden Nash.

But now a group of very serious people who have made their life's work the study of the Pacific leatherback turtle, have gritted their teeth behind fixed grins and decided to make the most of the fact that the turtle cannot avoid being funny.

Because the bitter fact is that the leatherback, which is as old as the dinosaurs to which it is closely related, and which sailed blithely through the cataclysmic event that wiped out all its earthbound cousins 65 million years ago, is now on the verge of extinction. It is the kind of thought that ought to give our entire species vertigo.

In 1980 there were more than 115,000 adult female leatherback turtles, but today there are fewer than 25,000 worldwide. In 1988, 1,367 female leatherbacks came to nest on Playa Grande in Las Baulas, the national park on the coast of Costa Rica, which is their last bolt hole on that coast. In 2001 there were only 67. The downfall of the Pacific, say the people who have devoted their lives to its study, seemed unthinkable when they were graduating from college, the Pacific so vast, the animal itself so bizarrely versatile, its rubbery shell enabling it do dive far deeper than other turtles, "so fertile", as Nash noted, that it laid tens of thousands of eggs.

But we've done it, mankind has done it; even this amazing achievement has not been beyond our unflaggingly destructive species. By dint of rampant seashore development, bright lights on the shore, rampant poaching (turtle eggs are esteemed as an aphrodisiac), pelagic longlines, a form of fishing net set by fishermen with 4.5 million hooks every night, the equivalent of 100,000 miles of barbed wire in the oceans, drift nets unfurled like huge underwater fences off the coasts of Peru and Chile—thanks to all these cunning schemes, we've finally got the bastards. Another few years should finish the ugly critters off.

"I never thought this ancient creature would be vulnerable to extinction," says Larry Crowder of the Duke University Marine Laboratory. "Unless something changes, the Pacific will be extinct within 10 to 30 years." But we are glutted with bad news, our eyes glaze over, we flip the page or change the channel. So in a last, desperate attempt to break through our boredom and evasiveness, the leatherback folk have turned the Pacific leatherback's desperate Pacific odyssey into an on-line children's game.

It's called the Great Turtle Race, and you can find it at greatturtlerace.com. The "race" is the web-based dramatisation of a natural event that has been going on for about 100 million years, way before the advent of man, back into the Cretaceous period and the heyday of the dinosaurs. From the gently sloping yellow sand of Playa Grande in Las Baulas National Park, Costa Rica, 11 huge female leatherback turtles, up to 2,000 lbs (907kgs) in weight and 6 ft long, wade and waddle and slap their way across the sand and into the eastern Pacific.

Their names are Turtleocity, Purple Lightning, Billie, Genevieve, Saphira, etc. On the website one is at the wheel of a car, one is reading a travel brochure while wearing a baseball cap and sunglasses, one has a dragon perched on its back.

Flip the card to read more about the turtle: "If it were possible to burn rubber under water," burbles Genevieve's card, "this would be the turtle to do it. She's revved up and ready to roll...She started the race with some fresh scrapes and wounds on her shoulder," says Windie's, "but this fighter completed the long trek to her nesting site and is back in the water and on her way. The sentimental favourite, she has a good shot at first place..."

Go to greatturtlerace.com to follow the progress of the turtles as, nesting finished, they launch themselves from the beach and set off in a long arc, 1,200 miles across the ocean to their feeding grounds in the Galapagos islands. Of course the turtles didn't all start out on 16 April, as the game pretends: like the Tour de France starts were

staggered—the turtles set off when they chose—so they are also calling it the Tour de Turtle. To make it more fun and encourage masses of people to go to the site they are making out that it is all synchronised. But what is true is that the leatherbacks are all starting from the same place—the beach that has become the last refuge of the leatherback on the East Pacific coast, the only spot along this great sweep of sand where they still come to nest—and the Galapagos is where they will all end up. Drift nets and pelagic longlines allowing, of course.

The internet turtle race is made possible by satellite tags: during the 20 minutes or so in which the turtles deposit their eggs in the sand they are immobile, in a sort of trance, allowing the Trust people to strap backpacks that contain the satellite transmitters to them. But of course the "race" is just a cute spin-off from the real purpose of the tags (which fall away after a couple of years).

The founder of the Trust, Jim Spotila of Drexel University, explains, "If we want to protect the leatherbacks, we need to know where they go and why they go there." The ocean changes all the time...So it's very difficult to protect migratory species like leatherbacks because they change their routes...The data that turtles are sending us will let us predict their journeys...and help us to protect them.

Tapping into the association of turtles with teenagers, mutants and ninjas is only one tiny aspect of the work of the Trust. Coaxing the Costa Rican government into making the area around Playa Grande a national park was one major achievement. Another, even more crucial, was the initiative of a woman called Maria Teresa Koberg, known today as the Turtle Mother of Costa Rica, in single-handedly shutting down the poaching industry which nearly destroyed the leatherback's Costa Rican nesting grounds, by getting the poachers to appreciate the damage they were doing.

Today the trust continues to work on making the national park a better environment for the turtles, buying land behind the beach from would-be developers, discouraging residents from hanging bright lights outside their properties. "We never intended to do all this," says James Spotila, another researcher. "But you study this magnificent animal and you see it going extinct if you don't step in and do something."

"It's like the kid walking by the dyke with the leak in it. You stick your finger in it. Then you cannot very well leave." Equally important, but even more difficult, is trying to rein in the practices of the fishing industry. "The Pacific is the Wild West," Frank Palladino, head of biology at Indiana Purdue University, told the LosAngeles Times.

"It's over-fished by these huge fleets, especially from Asia, and there are no regulations at all. It's not just leatherbacks. Everything is going in the Pacific: sharks, dolphins, billfish. Leatherbacks are just the first to go."

So the chances of Billie, Windie, Purple Lightning and the rest making it all the way to the Galapagos are less than brilliant—particularly given the experience of Frank Paladino's team in 1996. "Many of these satellite-tagged turtles seemed to hit a zone in the Pacific where the transmitters and

the turtles seemed to disappear...we suspect that they are being caught on longline and gill net fisheries near the Galapagos Islands, and off the coasts of Equador and Chile." So a warning to parents of small children for whom the Great Turtle Race might seem the perfect introduction to learning to care about the environment: it could all end in tears. Just like the real world.



参考译文

生活在太平洋的古老的棱皮龟面临着灭绝的危险。因此，专家们已经发现了一种新颖的方式来使人们关注这种强大的生物身处的险境和它们年复一年的长途迁徙，彼得·波海姆报道说。

棱皮龟与恐龙的关系是有近亲关系的，6,500万年前，一场洪水席卷了它们所有生活在陆地上的兄弟姐妹，但是它们却愉快地活了下来。然而令人痛苦的事实是，棱皮龟，这种和恐龙一样古老的生物，现在正濒临灭绝。这是一种使我们所有的物种都会眩晕的想法。

随着滨海地区的发展日益繁荣，海岸上明亮的灯光下，猖獗的偷猎(龟蛋被人们视为壮阳剂)，多钩长线撒网——一种每晚可以撒下450万钩的由渔民设置的渔网，相当于海洋上10万英里的铁丝网，漂移网像巨大的水下围栏一样在秘鲁和智利的沿海展开——由于所有这些巧妙的措施，我们终于捕获了这些低等物种。再过几年就可以让这些丑陋的生物消失了。

"我从未想过这种古老的生物会这么容易灭绝，"杜克大学海洋实验室的拉里·克罗德这样说："除非一些事情发生改变，否则太平洋棱皮龟将在10~30年之内灭绝。"但是我们听过太多这样的坏消息，我们的眼睛都呆滞了，我们用手指轻轻翻过这一页或是换个频道。所以在最后的绝望的尝试中，我们试图突破无聊和逃避的心理，而棱皮龟家族已经将太平洋棱皮龟的铤而走险的长途漂泊转变成一个线上儿童游戏。

它被称为大海龟族，你可以在greatturtlerace.com（大海龟种类网站）上发现它。"种族延续"是已经持续了约1亿年的自然行为——在人类到来之前，直到白垩纪时期和恐龙的全盛时期，这在网络上戏剧性地表现了出来。从哥斯达黎加的拉斯巴拉斯国家公园普拉亚格兰德的平缓的斜坡黄沙滩出发，11只庞大的雌性棱皮龟——重达2,000磅(907公斤)，长达6英尺——摇摇晃晃地跨越了这片沙地，长途跋涉进入了东太平洋。

它们的名字叫做特里奥塞蒂、紫色闪电、比莉、吉纳维芙、萨菲娅，等等。在因特网的网站上，一只棱皮龟坐在小汽车的轮子上，一只戴着棒球帽和太阳镜正在读一本旅游杂志，还有一只的背上停坐着一条龙。

登录greatturtlerace.com这个网站，你会发现，海龟的行程就是一个完成筑巢的过程，它们从海滩出发，并以长弧形的形状前行，横跨海洋到喂养小海龟的地方——加拉帕戈斯群岛，这段路程大约有1,200英里。当然并不是所有的海龟都在4月16日出发，就像要开始比赛那样：像环法自行车赛的开幕那样令人难以置信——当选择好日期后，海龟就出发了——因此他们也把这叫做海龟的旅行。为了使之更有趣并鼓励广大民众去登录他们正在制作的网站，所有这些都是同步的。但事实是这些棱皮龟都是从同一个地方出发的——海滩成了棱皮龟在中部太平洋海岸的最后一个避难所，这是沿着这条绵延的沙滩建造的唯一的居住地，而且他们还依

然会来这里的巢穴——并且他们的行程都将在加拉帕戈斯岛结束。当然，人们允许漂流的网和浮游的长渔线的存在。

信托的建立人，德雷塞尔大学的吉姆·斯波蒂拉解释说："如果想要保护棱皮龟，我们需要知道它们要去哪里，为什么去那里。" 海洋一直都在变化……因此要保护像棱皮龟这样的有迁居习惯的物种是非常困难的，因为它们会改变自己的路径……海龟给我们带来的资料将使我们能够预料它们的行程……并帮助我们来保护它们。

将海龟与青少年、突变体和忍者联系在一起仅仅是信托工作中一个小小的部分。说服哥斯达黎加政府将普拉亚格兰德周围的地方建成一个国家公园才是一个主要的成就。另一个更重要的人物是一位名叫玛丽亚·泰雷萨·科贝尔格的女士，如今，她以"哥斯达黎加海龟之母"而闻名，通过让偷猎者注意到他们的行为对海龟所造成的破坏，她轻而易举地制止了偷猎行为，这种偷猎行为几乎快要毁掉哥斯达黎加市的棱皮龟栖息地了。

今天，信托机构依然致力于海龟保护工作，使国家公园为棱皮龟提供一个更好的环境。他们从准开发商那里买下了海滩后面的陆地，阻止居民在他们的房屋外悬挂明亮的灯。"我们从来没想过要这样做，" 另一位研究员詹姆斯·斯波蒂拉这样说道："但是研究这种高贵的动物，如果不采取措施做些什么的话，人们会看到它逐渐灭绝。"

"这就像看到小孩在有裂缝的排水沟上行走一样。你会染指其中，然后无法全身而退。" 同样重要，但也更为困难的是，你要尝试着去限制捕鱼业的一些做法。"太平洋就是荒芜的西部，" 印第安纳普度大学生物学的负责人弗兰克·帕拉蒂诺，对洛杉矶时报如是说。

"这些超级捕鱼船队过度猎捕，尤其是来自亚洲的船队，完全没有遵循规章条例。不只是棱皮龟，太平洋的每一种生物都在消失：鲨鱼、海豚、长嘴鱼。棱皮龟只是第一个开始消失的生物。"

因此比莉、温蒂、紫色闪电和其他一些海龟到达加拉帕戈斯群岛的长途跋涉并没那么辉煌——特别是在1996年，给弗兰克·帕拉蒂诺的团队带来了教训。"这些有卫星标记的海龟中有许多都像是到达了太平洋某个区域，在这个区域这些发射机和海龟好像都消失了……我们怀疑它们是被长渔线和有刺网的渔场绊住了，这些东西设置在加拉帕戈斯群岛附近，偏离厄瓜多尔和智利海岸的位置上。" 因此，有一个对幼童家长的忠告：所有的一切将在泪水中结束，就像这个现实世界一样。对他们来说，伟大的海龟似乎是促使人们学会关爱环境的最好的因素。

核心词汇

leatherback ['leðəbæk] *n.* 棱皮龟

odyssey ['ɔdisi] *n.* 远行，奥德赛

blithely [blaiðli] *adv.* 愉快地

rampant ['ræmpənt] *adj.* 猖獗的，蔓延的

aphrodisiac [ˌæfrə'diziæk] *n.* 春药，壮阳剂

bastard ['bæstəd] *n.* 私生子

critter ['krɪtə(r)] *n.* 动物，生物

glut [glʌt] *vt.* 使……充满，过多供应

evasiveness [i'veisivnis] *n.* 逃避

dramatisation [dræmætai'zeiʃən] *n.* 改编剧本（生动表现）

waddle ['wɔdl] *vi.* 蹒跚而行

pelagic [pi'lædʒik] *adj.* 远洋的

association [əˌsəuʃə'eiʃən] *n.* 联合，结合

longline ['lɔŋlain] *n.* 多钩长线

Enhancing Awareness of Biodiversity

17. 提高生物多样性意识

机经选粹

这一篇是讲生物多样性的。

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Enhancing Awareness of Biodiversity

Biodiversity. The word, which is the shortened version of the term "biological diversity", is now a dominant theme in the global conservation movement.

But how many Malaysians have heard of this word? And among those who are familiar with it, how many are able to grasp its concept?

If chats with local conservationists are any indication, it is likely that the majority of Malaysians outside the conservation movement are ignorant about biodiversity issues. Yet enhancing institutional and public awareness of biodiversity concerns is one of the 15 strategies outlined in the National Policy on Biological Diversity, *launched more than two years ago, and aimed at guiding biological diversity planning, utilisation and management in Malaysia.*

Each of the 15 strategies is followed by a set of action plans. There are altogether 87 action plans. Other strategies include improving the scientific knowledge base (see report on Page 24), minimising impacts of human activities on biodiversity and strengthening and integrating conservation programmes.

The framing of Malaysia's biodiversity policy follows the ratification of the United Nations Convention on Biological Diversity (CBD) which came into force at the end of 1993 and has now been signed by about 180 countries.

The CBD provides a legal framework for conservation of global biodiversity,

sustainable use of biological resources, and the fair and equitable sharing of genetic resources. Admittedly, it takes effort to understand the notion of biodiversity—the word that has been coined to represent the variety of living things on Earth, including species, the genes that contribute to their variability, and the ecosystems in which they interact. But it is an initiative each human being must take, say conservationists.

And for the following reason. "Biodiversity is valuable because we cannot know what will be an asset in the future, because variety is inherently interesting and more attractive, and because our understanding of ecosystems is insufficient to allow us to be certain of the role and the impact of removing any component," says IUCN chief scientist Jeffrey A. McNeely. IUCN stands for The World Conservation Union. "Conservationists argue that it is very short-sighted to sacrifice any of this variability in order to achieve short-term financial and economic objectives, especially because less biodiversity may have profound implications for humanity."

Many would argue that the element of uncertainty alone is a compelling motivation for megadiversity countries like Malaysia to view biodiversity conservation seriously. In endorsing the CBD, Governments recognise that they are obliged to conserve national biodiversity through specific actions.

The CBD is one of the most significant products of the UNCED process. UNCED stands for the United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil, in June 1992. It is also known as the Earth Summit. But as nations take steps to implement the CBD, the question that begs to be answered is, what is the impact of Malaysia's biodiversity policy on the ground? Granted it was only launched more than two years ago, surely Malaysians can expect some developments in enhancing institutional and public awareness, *one of the 15 strategies mentioned earlier.*

"I think we are taking incremental steps but they are not comprehensive and co-ordinated," says Wendy Yap, head of Conservation Policy Unit at World Wide Fund For Nature (WWF) Malaysia. "The WWF is doing something, the universities and the government are also doing something but no one knows what they are about because they stay in the domain of each of these groups. Since no one is actually evaluating these projects, we cannot assess their impact."

If Environmental Protection Society of Malaysia (EPSM) adviser Gurmit Singh wants to know "how many Malaysian MPs are aware of the concept", Yap is concerned about access to simple information on biodiversity. "We are always talking about Malaysia being rich in biological resources. But where can the average Malaysian find such information readily?" she asks. Professor Datuk Dr Zakri A. Hamid, the Deputy Vice-Chancellor (Academic Affairs) of Universiti Kebangsaan Malaysia, regrets that conservation issues are seen by many Malaysians as "elitist". He says the Malaysian English Press is doing a good job of highlighting environmental concerns but the Malay Press needs to do a lot more.

Many sectors are to be blamed for this state of affairs including scientists who

should be more effective in taking their case to the mass media, policy-makers and politicians. Everyone, from civil servants at the Federal, State and local government levels to politicians and the man on the street, should be grounded on environmental issues because "without their understanding and support, we may lose our campaign to conserve our biological resources", says Zakri, who was also chairman of the task force that developed the national biodiversity policy. True. But are there enough competent people to do the job?

Forest Research Institute Malaysia's Biodiversity Division director Dr N. Manokaran concedes that Malaysia needs to build up its human capacity to expound biodiversity issues to the layman and government officials in a way that will interest them.

Just after Malaysia's biodiversity policy was launched in early 1998, there was an ambitious project to promote environmental awareness and education but it had to be aborted for lack of funds. The Ministry of Science, Technology and Environment had wanted to design a programme that will reach government officials, pupils and students as well as the public.

An appreciation of Malaysia's biotic wealth with its attendant biological, social and economic benefits is central to the conservation question. Unless that happens, good intentions will remain just that.

New opportunities to form partnerships between conservation and other sectors of society, including agriculture, forestry, fisheries, tourism, education and human health are just waiting to be seized.

Among other examples, conservationists and scientists like to talk about the undeveloped pharmaceuticals from wild plants and animals. Government officials say that Malaysia has made significant progress in realising the provisions of the CBD. Indeed, Malaysia was among the few countries in the world which took the lead in crafting a biodiversity policy right after affirming the CBD.

In addition, Malaysia is finalising three Bills relating to biodiversity—a Bill on access to biological resources, another on the national biodiversity council and yet another on biosafety.

A national workshop to discuss the three Bills will be held next month. But what next? "I think coming out with the National Policy on Biological Diversity is a milestone in the conservation arena," says Zakri.

"It would provide direction right up to the year 2020. That would set the stage for carrying out the 15 strategies but the next step would be to translate the various action plans into practical projects accompanied by who should be doing what."

Currently, the National Committee on Biological Diversity oversees the implementation of the national biodiversity policy and matters touching on biodiversity governance with the outside world. Its membership comprises the relevant ministries and departments, some of the States and several biodiversity experts.

The Cabinet decided soon after the Earth Summit eight years ago, that the Ministry of Science, Technology and Environment be

the national focal point for biodiversity. The Division of Conservation and Environmental Management at the ministry is charged with the task of co-ordinating the execution of all matters relating to biodiversity, both nationally and internationally.

It is understood that the division will be beefed up to undertake its diverse responsibilities efficiently and speedily. But the question observers want answered is, will the proposed national biodiversity council (which will supersede the existing National Committee on Biological Diversity) have the authority and the bite to oversee the execution of the 15 strategies?

Bear in mind that biodiversity is like land; it falls under the jurisdiction of the State Governments. Since the proposed national biodiversity council is likely to be chaired by a Minister and has representatives from the respective States, it may not have much clout.

Compare this to the National Land Council which is chaired by the Deputy Prime Minister with Chief Ministers and Menteris Besar as members. Note also that biodiversity is cross-sectoral in nature in that it covers plants, animals and micro-organisms on land as well as in water. Against that rationale, it should not fall within the confines of any single agency. It would be prudent to place biodiversity at the highest level of authority.



"Biodiversity(生物多样性)"是术语"biological diversity"的缩写形式，它在当今全球环保运动中是一个重要的主题。

如果从与当地自然资源保护者的谈话中显露的种种迹象中，你可能就会发现，大多数没有参与环境保护主义运动的马来西亚人很可能都忽视了生物多样性的问题。但增强生物多样性体制与提高公众意识已经成为15项有关生物多样性的战略国策之一。

马来西亚生物多样性政策纲领的制定，需经过联合国生物多样性公约(CBD)的批准并遵守这项公约。联合国生物多样性公约于1993年年底开始生效，现签署的国家已有约180个。

联合国生物多样性公约为保护全球生物多样性、生物资源的可持续利用以及公平公正地分享生物遗传学资源提供了法律保障。无可否认，这促进了对生物多样性这一概念的理解——这个词的出现，是指地球上的各种生物种类，包括物种、使生物具有变异性的基因以及生物之间互相作用的生态系统。然而现在自然资源保护者们说，这是每个人都必须主动采取的行动。

很多人会认为，仅不定因素一项就是对像马来西亚这样的生物多样性最丰富的国家起到一个强制性的推动作用，使他们尤为重视生物多样性的保护。为了支持联合国生物多样性公约，各国政府承认他们有义务采取特殊措施保护国家生物多样性。

联合国生物多样性保护公约是联合国环境及发展大会议程最重要的成果之一。UNCED代表联合国环境及发展大会，这是于1992年7月在巴西里约热内卢举行的大会，即众所周知的地球峰会。但是，各个国家采取措施履行这项公约的同时，也遇到了迫切需要解答的问题——马来西亚的生物多样性政策在其国家产生了什么影响？就算它只是在两年多前才开始执行的，在增强环境体制和提高公众意识上，马来西亚人当然希望会有所进展。

“我想，我们正采取更多的措施，虽然它们并不是那么全面以及有效协调，”世界自然基金会(WWF)环境保护政策部的部长马来西亚人温蒂·亚普说：“世界自然基金会正采取措施，大学和政府也在想办法，但是没人知道是关于什么的，因为他们都只是在各自的领域里采取措施。因为没有人切实地评估过这些项目，所以我们也不能确定它们的影响力有多大。”

如果马来西亚环境保护协会(EPSM)顾问葛米星想知道，有多少马来西亚的议员意识到这个概念，那么，雅浦会对人们只是简单地了解生物多样性的信息感到忧虑，“我们一直在强调马来西亚生物资源富饶。但是马来西亚的平民老百姓从哪儿能够立即获取这些消息？”她问。保护生物多样性的事是很多被马来西亚人当作“杰出人物”做的事，马来西亚科班萨大学副校长(管理学术事务)达图·扎克里·哈米德教授对此深表遗憾。他说，马来西亚英语出版社在强调环境保护意识方面做得很好，但是马来西亚出版社所做得只是杯水车薪，还需要大量的工作去做。

很多部门因这次事件而受到责备，包括那些应该更及时有效地把结果告知之于大众媒体、政治决策者和政治家的科学家。从联邦政府、州政府、当地政府的人民公仆到政治家，再到大街上每一个人，都应该以环境问题为出发点。扎克里指出，因为“没有他们的理解和支持，我们保护我们的生物资源的运动可能就会失败”。同时，他也担任制定国家生物多样性政策特别工作组的主席。事实的确如此。然而，是否有那么多能干的人来担当大任？

马来西亚森林研究院生物多样性部门主任N.马诺卡兰博士承认，马来西亚需要以能激起大家兴趣的方式，将生物多样性事宜对大众和政府官员做详细的解释。

1998年年初，就在实施马来西亚生物多样性政策以后，曾制定过一个以提升环境意识和环境教育为目的的宏伟项目，但是由于资金的匮乏，不得不勒令取消。科学部、技术部和环境部曾想制定一个能深入到政府官员、未成年人、学生以及大众的规划。

对马来西亚的生物财富以及对随之而来的生物、社会和经济利益的评论成为环境保护问题的核心。除非这一切发生，否则积极的意义仍只会停步不前。

保护生物多样性和社会其他部门之间提供形成合作关系的新机会，这些部门包括农业、林业、渔业、旅游业、教育和人类健康等等部门，它们也正等着抓住这一机会。

在其他例子里，保护论者和科学家喜欢谈论的是还未从野生植物和动物中研发出来的药物。政府官员称马来西亚在实现联合国生物多样性公约的规定上已经作出了重要贡献。事实上，马来西亚是世界上在签订联合国生物多样性公约后就率先制定生物多样性条约的为数不多的国家之一。

另外，马来西亚正在制订有关生物多样性的3项法案——生物资源使用法案、国家生物多样性委员会法案以及生物安全法案。

目前，国立生物多样性委员会的职责是监督国家生物多样性政策的执行情况以及与外界相关的涉及生物多样性管理权的事宜。它由相关的部门和机关、一些州政府部门和机构以及一些生物多样性方面的专家组成。

8年前，内阁在地球峰会之后刻不容缓地做出决定：将科学、技术和环境部门定为国家管理生物多样性的核心部门。这些部门的保护和环境管理分部负责协调和履行国际国内所有与生物多样性相关的各项事宜。

可以理解，部门的任务加重了，它们要有效、迅速地担负起纷繁复杂的责任。但是评论者们想要解答的问题是：所推荐的国家生物多样性委员会(取代了现在的国立生物多样性委员会)有权力和能力来监督贯彻执行这15项策略吗？

要记住，生物多样性就像土地，它在国家政府管辖范围之内。由于受推荐的国家生物多样性委员会可能由一个部长负责，其中每个州又都有各自的代表，因此，它的影响力也许微乎其微。

核心词汇

biodiversity [ˌbaiəuˌdai'və:səti] *n.* 生物多样性
ratification [ˌrætifi'keiʃən] *n.* 批准，认可
equitable ['ekwitəbl] *adj.* 公平的，公正的
admittedly [əd'mitidli] *adv.* 公认地，显然
initiative [i'niʃiətiv] *n.* 主动行动，首创精神
megadiversity ['megəˌdai'və:səti] *n.* 巨大多样性
incremental [inkri'mentəl] *adj.* 增量的，增加的
elitist [ei'li:tist] *n.* 杰出人物
competent ['kɔmpitənt] *adj.* 有能力的，胜任的
concede [kən'si:d] *vt.* 承认，让步
layman ['leimən] *n.* 凡人，门外汉
abort [ə'bɔ:t] *vt.* 流产，使中止
fishery ['fiʃəri] *n.* 渔场(渔业)
provision [prə'viʒən] *n.* 规定，条款
affirm [ə'fə:m] *vt.* 断言，确认
biosafety [ˌbaiəu'seifti] *n.* 生物安全
ministry ['ministri] *n.* (政府的)部
council ['kaunsəl] *n.* 理事会，委员会
supersede [ˌsju:pə'si:d] *vt.* 代替，取代
clout [klaut] *n.* 巨大的影响

Facial Expressions

18. 面部表情

机经选粹

这一篇讲面部表情（facial emotion）。



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Facial Expressions

Evidence mounts that making, and perhaps recognising, expressions is inherited.

Charles Darwin once noted that he had no great quickness of apprehension nor wit, nor power to follow a long and purely abstract train of thought. What made him "superior to the common run of men"was his ability to notice things that can easily escape attention. Thirteen years after publishing *The Origin of Species*, Darwin produced a lesser-known book in which he argued that animals, like people, feel emotions and express them using their faces. Humans, he thought, were not alone in opening their mouths when listening, pursing their lips when concentrating or touching faces with loved ones.

Darwin also believed babies are born able to recognise the facial expressions of others. His first child had suddenly assumed a melancholy expression in an experiment where the maid pretended to weep, even though the boy had apparently never before witnessed another person crying. This, Darwin thought, suggested that his son could not have learned that crying is linked to sadness and must have somehow inherited the knowledge.

Modern biologists have avoided experimenting with babies and eschewed linking animal "expressions"with human ones, for fear of committing the zoologists' sin of anthropomorphism. Nonetheless, Darwin's argument for the inheritance of facial expressions is gaining credence, most recently from an experiment by Gili Peleg and colleagues of the University of Haifa, in Israel. Instead of babies and animals, they used blind people.

It is obvious that a characteristic has been inherited in diseases such as haemophilia and traits such as naturally red hair: such things cannot be moulded by experience. But to tease apart what can be learnt about forming facial expressions from what is genetically programmed; Ms Peleg had to find people who could not have copied those around them.

Congenitally blind people fall into this category. In a recent paper in the *Proceedings of the National Academy of Sciences*, Ms Peleg describes filming 21 interviews with people who have been blind since birth, and 30 interviews with normal-sighted people, all of whom were genetically related to her blind subjects. Ms Peleg asked her volunteers to give detailed descriptions of experiences that caused them to feel sad, angry, disgusted and joyful. As they did so, their faces expressed the appropriate emotion. She then gave her volunteers a puzzle and kept the camera rolling as their faces demonstrated concentration. She induced expressions of surprise by interrupting concentration with a nonsensical question.

Next, with stamina for detail that would have impressed Darwin himself, Ms Peleg watched the recorded interviews and listed the parts of the face that moved when each volunteer expressed each emotion. In doing so, she created a numerical "expression signature" for everyone in the study and gave herself something to compare using statistics.

First, she looked at each emotional state separately. For anger, sadness and concentration, the detailed ways that blind people moved their faces were significantly more similar to those of their family members than to those of strangers. But the differences she found for disgust, joy and surprise were not great enough to draw any firm conclusions. Second, she analysed the expression signatures—that is, the aggregate measure of all the emotions—to see whether they gave her enough information to match blind and seeing family members. They did, allowing her to place 80% of the people into the correct family group. In fact, even the angry expressions alone were variable enough to classify her volunteers into families 75% of the time.

Some of this family resemblance is certainly a consequence of similar muscular and skeletal structures underlying the face. Some of it is also likely to be the result of unlearnt instructions emanating from the brain. Either way, it would delight Darwin.

How the brain recognises these facial expressions, however, is unclear. One intriguing possibility is that the brain recognises emotions in a similar way to that in which it identifies individuals. That is an implication of unpublished research using macaque monkeys by Doris Tsao and Winrich Freiwald, of the University of Bremen, in Germany.

The pair recorded how cells in a region of the brain devoted to facial recognition, called the fusiform face area, code the information. They categorised facial dimensions such as the distance between the eyes, then recorded the electrical activity of one brain cell at a time while they showed cartoons to the macaques. This allowed them to

correlate the facial characteristics of each drawing with the firing patterns of the cells. Each cell appeared to be tuned to up to eight different facial dimensions. The results provide one mechanism by which the brain could gather information on expressions. For example, the pair found cells sensitive to slanted eyebrows, which could be relevant in recognising anger.

However, another study, presented this week at the annual Society for Neuroscience conference, in Atlanta, cast doubt on the idea that the mechanisms for facial recognition and reading emotions are tightly linked.

Brad Duchaine of University College London studied eight siblings from a family that suffers from a condition known as prosopagnosia, or the inability to identify people from their faces. He found that their disability seems to run in families, but that people with prosopagnosia could nevertheless understand the facial expressions of others. Unless prosopagnosia sufferers were co-opting parts of the brain that those without the condition use for other purposes, that suggests reading faces and reading emotions are different processes.

Identifying individuals and reading the emotional state of others is an advantage among animals that form societies. That said, facial expression does not seem to be a prerequisite for such interactions. Ants, bees and wasps form complex communities but do not seem to rely on facial characteristics for their communication. Yet no one doubts that bees get angry, as Darwin himself pointed out.

参考译文

证据表明，面部表情是与生俱来的，识别表情或许也是这样。

查尔斯·达尔文曾说过自己没有迅捷的悟性、灵敏的机智，同时也缺乏沿着一条漫长而纯粹的抽象思维之路不断思考的能力。他之所以“超乎常人”得益于他能够从轻易不引人注意的事物中发现某种事物的能力。《物种起源》出版13年之后，达尔文写了一本名不见经转的书。在书中，达尔文论述了动物同人类一样，能够通过面部表情感知并传达各类情感。同时，他认为，侧耳聆听时不禁张口，聚精会神时抿紧嘴唇，以及和爱的人接触脸庞等并非人类所独有的行为。

同时，达尔文也相信婴儿天生能够识别其他人的面部表情。在一次实验中，达尔文让女仆故作痛苦流泪状，结果自己的长子突然之间也露出了一副忧伤的神情，虽然在这之前他从未亲眼见到他人哭泣。这在达尔文看来，显然他的儿子不可能是通过后天的学习而将落泪同悲伤联系起来的，而肯定是通过某种遗传机制获得的。

现代的生物学家们已经避免利用婴儿进行实验了，并且忌讳将动物的表情同人类联系在一起，因为他们害怕动物学家们被人扣上拟人论的罪恶帽子。尽管如此，达尔文

所强调的面部表情可遗传的论点正不断得到证实：最新的证据来自以色列海法大学的吉丽·皮莱格博士及其同事们所做的实验。他们的实验既没有用婴儿，也没有用动物，而是邀请了一些盲人作为对象。

很明显，有些特征是伴随疾病遗传的，如血友病等，还有一些外表特征，如天生的红发，也是先天遗传的：这些并不是经历所能塑造。但是，要从那些遗传编码中窥见一斑而知脸部表情习得的究竟，皮莱格博士则必须找到一些无法从旁人那里习得这些表情的人们。

先天性失明者就属于这一类。在最新发表在美国国家科学院院报(PNAS)上的一篇报告中，皮莱格博士描述了对21名先天失明的人以及30名视力正常但亲属失明的人采访时所拍摄的过程。皮莱格博士要求这些受访志愿者们对那些让他们感到悲伤、愤怒、厌恶和愉悦的经历分别作一番详细的描述。描述时，他们脸上会流露出相应的表情。接着，她给每一位志愿者出了个难题，同时摄像机对准他们的表情，这时的表情会显示他们正聚精会神地思考这个问题。然后，她用一个没有意义的问题突然打断受访者的专注，借此来引发对方惊讶的表情。

随后，凭着一股令达尔文印象深刻的对细节锲而不舍追求的激情，皮莱格博士仔细查看了采访录像，并列出了每位受访者在表达每一种情绪时运动的脸部部位。正是这样，她在研究中给每个受访者制作了一套数字形式的“表情签名”，同时她自己也得到了可以用作统计对比的数据。

首先，她分别仔细观察了所呈现的每种情绪。就愤怒、悲伤以及专心致志的表情而言，盲人们脸部移动的具体方式同家庭成员的相似程度明显高于陌生人。但是，就厌恶、愉悦和惊讶等表情而言，这种相似度的差异不显著，并且不足以得出任何确切的结论。其次，她分析了表情签名——一种所有情绪状态的集合衡量——以确定这些信息是否足以将那些失明者同他们的家庭成员正确配对。他们给出了信息，这使她把80%的人归入其正确的家族。事实上就本次试验而言，甚至仅凭愤怒表情这一项提供的变异程度，就足以将75%的志愿者正确地归入各自的家族。

在家庭的相似性中，有些肯定是由隐藏在面部以下脸部肌肉和骨骼结构的相似而引起的。而有些也很可能是由大脑发出非后天性的(即本能性的)指令所致。无论是哪种原因，这都令达尔文十分开心。

然而，大脑是如何识别这些面部表情的，还尚不清楚。有一种可能性是，大脑识别情绪的方式同辨认个体的方式是相似的，这听上去着实令人感兴趣。这种观点是根据德国不莱梅大学的多丽丝·曹和温里希·弗赖瓦尔德对短尾猴的研究结果所作的推测，这项研究还没有公布。

这两个人都记录了在大脑中一个称为“梭形脸部区(FFA)”的负责脸部辨认的区域，以及细胞如何对信息进行编码。他们对各类面部距离进行分类，如两眼之间的距离等。接着，他们将动画展示给短尾猴看，并记录该区域中单个脑细胞每次电活动的情况。这些数据使他们能够建立起每张卡通画上的面部特征同脑细胞放电型之间的关系。研究表明，单个脑细胞可以接受来自多达8类不同的面部距离传递的信息。这些结果揭示出一种机制，通过这种机制大脑能够收集有关表情的信息。例如，他们两人发现脑细胞对斜眉毛这个特征非常敏感，这可能同辨认愤怒的情绪有关。

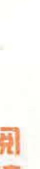
然而，另一项研究对脸部辨认和情绪解读两种功能密切联系的机制的观点提出了质疑。该项研究于本周在亚特兰大召开的(美国)神经科学学会年会上进行了报道。

伦敦大学学院的布拉德·杜查纳博士，研究了来自同一家族的8名成员，该家族成员普遍患有人面失认症，即无法根据脸部辨认对方。布拉德博士发现，虽然他们似乎连自己的家族成员都无法辨认，但却能够读懂其他人的面部表情。除非人面失认症患者借用了大脑中用于其他功能的部分，否则上述研究则表明辨认长相同解读情绪是两种不同的过程。

辨认个体、解读其他人的情绪状态对于形成社群的动物来说是一种优势。换言之，面部表情似乎并不是进行社交活动的先决条件。蚂蚁、蜜蜂和黄蜂各自均构成了复杂的社群，但似乎并未依靠面部特征进行交流。但是，正如达尔文自己指出的那样，没人怀疑蜜蜂也会生气。

核心词汇

apprehension [ˌæpriˈhenʃən] *n.* 理解
superior [sjuːˈpiəriə] *adj.* 出众的
concentrate [ˈkɔnsentreit] *vi.* 集中，聚集
melancholy [ˈmelənkəli] *adj.* 忧沉的，愁思的
witness [ˈwitnis] *vt.* 目击
anthropomorphism [ˌænθrəpəuˈmɔːfizəm] *n.* 神人同形同性论，拟人论
expression [iksˈpreʃən] *n.* 表情
credence [ˈkriːdəns] *n.* 信用，信任
haemophilia [hiːməuˈfiliə] *n.* 血友病
mould [məuld] *v.* 模压，形成
category [ˈkætigəri] *n.* 种类，类别
puzzle [ˈpʌzl] *n.* 难题
numerical [nju(ː)ˈmerikəl] *adj.* 数字的
signature [ˈsignətʃə] *n.* 签名，签字
statistics [stəˈtistiks] *n.* 统计数值，统计资料
significantly [sigˈnifikəntli] *adv.* 较大地，相当地
disgust [disˈgʌst] *n.* 厌恶，嫌恶
fusiform [ˈfjuːzifɔːm] *adj.* 梭形的
correlate [ˈkɔrileit] *vt.* 使有相互关系
slanted [slɑːntid] *adj.* 倾斜的
eyebrow [ˈaibrau] *n.* 眉毛



Strange but True: Whale Waste Is Extremely Valuable

19. 不可思议但千真万确：鲸的排泄物具有很高的价值

机经选粹

这一篇是讲ambergris(龙涎香)的，一种脂肪物质，用以制香料。一开始讲述ambergris很久以前就有了，然后说了它的用途：医药、香料、香水等。然而人们对它的来源知之甚少，所以物以稀为贵。后来讲述以前人们一直把ambergris（龙涎香）和amber（琥珀）混为一谈。但后来有人写了一本书讲述了它们的区别。但具体ambergris来自哪里还是个谜。接着又讲述了ambergris（龙涎香）的来源以及产生的过程——sperm whale 吃的一种食物beaks of squalid，但由于不能完全消化，就转化为体内垃圾，排泄出来之后在空气中硬化而形成。最后提到因人类捕杀sperm whale导致其濒临灭绝，因此人类开始采取保护措施，在工业生产中采用了很多ambergris的替代品。

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Strange but True: Whale Waste Is Extremely Valuable

According to the ancients, parfumeurs and Arab royalty, the old saying might as well go: "Worth its weight in whale waste".

A ten-year-old vacationing in Wales stumbles across a lump worth nearly $6,000. A 67-year-old New York native receives a candlelike rock in the mail from her 80-year-old sister and discovers she may be $18,000 richer. All because a whale had a bit of indigestion.

That upset stomach creates ambergris, a rare substance that has been highly valued for thousands of years as an ingredient in perfume and pharmaceuticals. Ambergris originates in the intestines of male sperm whales after they dine on squid, whose hard, pointy beaks

abrade the whales' innards. Scientists believe that the whales protect themselves by secreting a fatty substance in their intestines to surround the beaks. Eventually the animals cast out a huge lump, up to hundreds of pounds at a time.

But don't refer to it as "whale vomit"; scientists postulate that whales do not expel ambergris through their mouths. No one has ever seen a sperm whale excrete ambergris, although sperm whale expert Hal Whitehead of Dalhousie University in Halifax, Nova Scotia, admits that it is assumed the voiding takes place as fecal excretion, because when first cast out, he says, "Well, it smells more like the back end than the front."

Viscous, black, stinky blocks of freshly expelled ambergris float on the ocean's surface. Sun, air and salt water oxidize the mass, and water continually evaporates. It hardens, breaks into smaller chunks and eventually becomes grey and waxy, embedded with small black squid beaks. The weathered chunks exude a sweet, earthy aroma likened to tobacco, pine or mulch. The quality and value of any given chunk depend on how much time it had spent floating or otherwise aging, says expert ambergris broker Bernard Perrin, because "it ages like fine wine."

For thousands of years this sea treasure has been highly prized. Middle Easterners historically powdered and ingested it to increase strength and virility, combat heart and brain ailments, or to spice food and drink. The Chinese called it "dragon's spittle fragrance." Ancient Egyptians burned it as incense. A British medical treatise from the Middle Ages informs readers that ambergris can banish headaches, colds and epilepsy, among other ailments. And the Portuguese took over the Maldives in the sixteenth century in part to gain access to the island's rich bounty of the redolent stuff.

The Arabic *anbar* refers to this very whale-based substance and is the root of the word amber. Centuries ago the French employed *amber gris and amber jaune* (gray amber and yellow amber) to distinguish between animal-based ambergris and what today has become the standard meaning: the golden-hued vegetal resin.

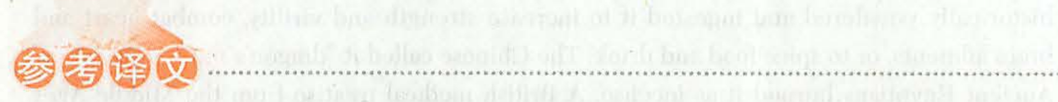
Like other animal-based perfume components (such as musk) ambergris has a scent all its own—derived from its chemical component ambrein—that it imparts to popular perfumes such as Chanel No. 5. It also enriches the other olfactory notes of a perfume, much as salt enhances flavors and spices, and, most importantly, it prolongs a perfume's other scents. As odor chemist George Preti of the Monell Chemical Senses Center in Philadelphia explains, ambergris molecules are lipophilic (fat-loving), as are perfume molecules, but the ambergris molecules are larger and heavier. "The odor molecules have a high affinity for the other lipophilic molecules, so they stay associated with the ambergris molecules and don't go into the vapor phase all at once," Preti says.

American perfume companies no longer mix ambergris into their fragrances, most likely because of confusing legalities surrounding its sale here. Internationally, however, the trade is legal and Perrin has no problem finding French perfume companies to buy his stock. "We also sell it to

a royal family in the Middle East and they use it as an aphrodisiac. Apparently they take some milk, some honey, and grind up small quantities of the amber and put that in as well," he says.

Many aspects of ambergris remain a mystery. Why is ambergris more commonly found in the southern hemisphere, though sperm whales range all the world's seas? Why is it only sperm whales—and particularly male sperm whales—that create it? How did ancient Middle Easterners decide to start using it for medicine, or decide that "eau de whale" would be a compelling fragrance?

Some, but not all, scent qualities of ambergris have been synthesized, so the original remains valuable. With sperm whale numbers down from the 1.1 million estimated prior to whaling to approximately 350,000 today, less ambergris floats on the seas. Still, Whitehead says the population is slowly recovering, and even though most findings turn out to be rocks or wax or other ocean detritus, beachcombers and fishermen continue to scour the sands and waves in hope of stumbling across a weathered chunk of this sea gold.



一个10岁的孩子在威尔士度假时偶然被一个价值近6,000美元的块状物绊倒。一位67岁的纽约人从她80岁的姐姐邮寄的包裹里收到一块类似蜡烛的岩礁，发现她可能由此获取价值1.8万美元的财富。所有这一切都源于一条鲸有点消化不良。

鲸的肠胃不适创造了龙涎香，一种罕见的、价值极高的物质，数千年来一直被作为香料和配药的成分。当雄性抹香鲸吃完乌贼后，为了防止这些乌贼硬而尖的嘴磨伤了它的内脏，龙涎香便从其肠道里分泌出来。科学家们坚信，抹香鲸通过在其肠道里分泌一种脂肪物质把硬而尖利的物体包围起来，使自己免受伤害。最后抹香鲸排泄出一个巨大的块状物，一次排出重达数百磅。

但不要把这种物质称之为“鲸鱼呕吐物”；科学家推断抹香鲸不是通过嘴排出龙涎香的。从来没有人看到过抹香鲸排泄龙涎香，虽然位于新斯科舍省哈利法克斯的达尔豪斯大学的抹香鲸专家哈尔·怀特海德认为，这种排泄被推断是粪便排泄，他说，因为当它最初被排泄出来时，“气味更像是从肛门而不是从嘴发出的。”

新排出的黑色黏稠状臭味扑鼻的龙涎香块会漂浮在海面上。经过阳光、空气以及海水不断氧化，水分不断蒸发、变硬、碎裂成小块状物，最终形成一个嵌着黑色小乌贼嘴的灰白色蜡状物。这些风化的块状物就会散发出甜甜的泥土芳香，就像香烟、松树或者护根的香味。内行的龙涎香经纪人伯纳德·佩林说，任何已成形的龙涎香的质量和价值依赖于它漂浮或者风化的时间，因为“它像高档葡萄酒一样，越久越醇。”

上千年来这份海洋宝藏已受到高度重视。历史上的中东人将它研磨成粉食用，增强力量和活力，治疗心脑疾病，或者作为食品和饮料的香料。中国人称之为“龙涎香”。古埃及人把它用作香料来燃烧。一篇中世纪的英国医学论文告诉读者，龙涎香还可以治疗头

痛、感冒和癫痫等其他疾病。葡萄牙人在十六世纪接管马尔代夫，部分原因是想获取岛上这种丰富的芬芳物质的使用权。

阿拉伯语“anbar”指的正是鲸体内产生的物质，它是单词“amber”的词根。几个世纪以前，法国人使用“amber gris”和“amber jaune”(灰色琥珀和黄色琥珀)来区分动物分泌出来的龙涎香和今天已成为标准含义的金色植物性树脂。

像其他以动物体内产生的香料成分(如麝香)一样，龙涎香有其自身特有的香味——这种香味来自于其化学成分龙涎香醇，它赋予如香奈尔5号这样受欢迎的香水中无限的魅力。正如盐增添了食物的风味和香气，龙涎香也丰富了香水的其他嗅觉感受，而且，最重要的是，它延长了香水中其他香味的持续时间。按照费城蒙尼奥化学研究中心的气味化学家乔治·普雷蒂的解释，龙涎香分子是亲脂性的(紧附脂肪)，香水分子也是这样，但龙涎香分子更大更重。普雷蒂说：“气味分子对其他亲脂分子有高亲和力，所以它们与龙涎香分子相连，而不会马上成为蒸汽。”

美国香水公司不再把龙涎香混合进他们的香水里，很可能是由于关于出售龙涎香的立法还很混乱。但这在国际上贸易是合法的，佩兰找到法国香水公司购买他的股份是不成问题的。他说：“我们也把它出售给中东的皇室家族，他们把它作为催情剂使用。显然，他们混合一些牛奶、蜂蜜，还研磨少量的琥珀加入其中。”

龙涎香的许多方面仍然是一个谜。虽然抹香鲸遍及世界上所有的海域，但为什么龙涎香在南半球更为普遍？为什么只有抹香鲸——尤其是雄性抹香鲸才能产生龙涎香呢？古代中东人是如何决定开始用它入药，或如何决定“鲸香水”将会是一种引人注目的香水？

有一部分但并非所有的龙涎香的香味都已被合成，所以原产品仍然是相当昂贵。随着抹香鲸的数量从捕鲸以前估计的110万下降到今天的35万，越来越少的龙涎香漂浮在海上。不过，怀特海说，这个数量正在慢慢恢复，即使大多数找到的是岩石、蜡或者其他的海洋碎石，海滨流浪汉和渔民们依然继续在沙地和海浪里四处寻觅，希望撞上一块风化的海洋黄金。

核心词汇

stumble ['stʌmbl] *vi.* 绊倒，失足
lump [lʌmp] *n.* 块状
ambergris ['æmbəgri(:)s] *n.* 龙涎香
pharmaceuticals [ˌfɑ:mə'sju:tikəlz] *n.* 医药品
intestine [in'testin] *n.* 肠
squid [skwid] *n.* 乌贼
excrete [eks'kri:t] *vt.* 排泄，分泌
freshly ['freʃli] *adv.* 最近，新近
oxidize ['ɔksiˌdaiz] *vt.* 使氧化
liken ['laikən] *vi.* 比喻，比拟
broker ['brəukə] *n.* 经纪人
spittle ['spitl] *n.* 唾沫，口水
fragrance ['freigrəns] *n.* 香味
epilepsy ['epilepsi] *n.* 癫痫症
bounty ['baunti] *n.* 慷慨，恩惠
perfume ['pə:fju:m] *n.* 香水，香料
molecule ['mɔlikju:l] *n.* 分子
lipophilic [ˌlipə'filik] *adj.* 亲脂性的
affinity [ə'finiti] *n.* 密切关系，亲和力
grind [graind] *vi.* 摩擦，磨碎
synthesize ['sinθisaiz] *vt.* 合成，综合
detritus [di'traitəs] *n.* 碎石



DNA Patterns Map the Origin of Us

20. DNA模式描绘人类起源

机经选粹

这一篇讲的是人类学研究，包括血统、基因等。

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DNA Patterns Map the Origin of Us

We're all descendants of 10 sons of Adam and 18 daughters of Eve, geneticists say all brothers' Nicholas Wade NEW YORK.

The Book of Genesis mentions three of Adam and Eve's children: Cain, Abel and Seth. But geneticists, by tracing the DNA patterns found in people throughout the world, have now identified lineages descended from 10 sons of a genetic Adam and 18 daughters of Eve.

The human genome is turning out to be a rich new archive for historians and prehistorians, one whose range extends from recent times to the dawn of human existence.

Delvers in the DNA archive have recently found evidence for a prehistoric human migration from Western Asia to North America; identified the people who seem closest to the ancestral human population; and given substantial weight to the whispers, long dismissed by historians, that Thomas Jefferson fathered a family with

his slave Sally Hemings.

A new history of Britain and Ireland by Norman Davies, The Isles, (Oxford University Press) begins with an account of Cheddar man, an 8,980-year-old skeleton found near Cheddar in Somerset, from which mitochondrial DNA was recently extracted. The DNA turned out to match that of Adrian Targett, a Cheddar teacher, proving a genetic continuity that had endured through nine millennia.

Unlike the DNA test used in forensic cases, which is designed to identify individuals, DNA analysis that seeks to reach back in time usually focuses on lineages, not individuals. From patterns in the DNA data, biologists can often estimate the sizes of ancient populations and even the approximate dates when one group of people split from another.

Though DNA can bear on historical questions, often by acting as a long-range paternity test, its most spectacular use has been in prehistory, where it has added a new dimension to the bare framework provided by archaeology.

The most detailed human family tree so far available is one constructed over many years by Douglas Wallace and his colleagues at the Emory University School of Medicine in Atlanta. Wallace's tree is based on mitochondrial DNA, tiny rings of genetic material that are bequeathed only by the egg cell and thus through the maternal line. A counterpart tree for men, based on analysis of the Y chromosome, has been prepared by Peter Underhill and Peter Oefner of Stanford University.

Population geneticists believe that the ancestral human population was very small—a mere 2,000 breeding individuals. But the family tree based on human mitochondrial DNA does not trace back to the thousand women in this ancestral population. The tree is rooted in a single individual, the mitochondrial Eve, because all the other lineages fell extinct.

The same is true of the Y chromosome tree, a consequence of the fact that in each generation some men will have no children, or only daughters, so the number of different Y chromosomes may steadily diminish, even if the population stays the same size.

This ancestral human population lived somewhere in Africa, geneticists believe, and started to split up some time after 144,000 years ago, give or take 10,000 years.

Mitochondria, which live inside human cells but outside the nucleus, escape the shuffling of genes that occurs between generations and are passed unchanged from mother to children. In principle, all people should have the same string of DNA letters in their mitochondria. In practice, mitochondrial DNA has steadily

accumulated changes over the centuries because of copying errors and radiation damage.

Because women were steadily spreading across the globe when many of these changes occurred, some changes are found only in particular regions and continents. Wallace discovered that almost all American Indians have mitochondria that belong to lineages he named A, B, C and D. Europeans belong to a different set of lineages, which he designated H through K and T through X. The split between the two main branches in the European tree suggests that modern humans reached Europe 39,000 to 51,000 years ago, Wallace calculates, a time that corresponds with the archaeological date of at least 35,000 years ago.

In Asia, there is an ancestral lineage known as M, with descendant branches E, F and G as well as the A through D lineages also found in the Americas.

In Africa, there is a single main lineage, known as L, which is divided into three branches. L3, the youngest branch, is common in East Africa and is believed to be the source of both the Asian and European lineages.

Wallace's mitochondrial DNA lineages are known technically as "haplogroups" but more colloquially as "daughters of Eve," because all are branches of the trunk that stems from the mitochondrial Eve.

The Y chromosome tree has not yet been published by the Stanford researchers. But in a book that came out in March, Genes, People and Languages, a colleague at the university, Luca Cavalli-Sforza, sketched a preview of the findings.

The tree is rooted in a single Y chromosomal Adam, and has 10 principal branches, Cavalli-Sforza reports. Of these sons of Adam, the first three (designated I, II and III) are found almost exclusively in Africa. Son III's lineage migrated to Asia and begat sons IV-X, who spread through the rest of the world —to the Sea of Japan (son IV), northern India (son V) and the South Caspian (sons VI and IX).

Wallace has recently been exploring the root of the mitochondrial tree. In an article published in March in The American Journal of Human Genetics, he and colleagues identify the Vasikela Kung of the northwestern Kalahari desert in southern Africa as the population that lies nearest to the root of the human mitochondrial DNA tree. Another population almost equally old is that of the Biaka pygmies of central Africa. Both peoples live in isolated regions, which may be why their mitochondrial DNA seems little changed from that of the ancestral population. "We are looking at the beginning of what we would call Homo sapiens," Wallace says.

One of the most vexed issues in human prehistory is the timing and number of migrations into the Americas. Joseph Greenberg, a linguist at Stanford University, has proposed three migrations, corresponding to the three language groups of the Americas, known as Amerind, Na-Dene and Eskimo-Aleut. Wallace's mitochondrial DNA data broadly support this thesis, though the arrival of the Amerind-speakers seems more complex than a single migration.

Of the A through D lineages found in American Indians, A, C and D also occur in Siberian peoples, suggesting that their ancestors were the principal source of the Amerind-speakers' migration. But the B lineage, though it is found elsewhere in Asia, has not turned up in Siberia, a hint that the B people may have taken a sea route to the Americas and then merged there with their A- , C- and D-carrying cousins.

In 1998, Wallace and his colleagues discovered the X pattern, a rare European lineage, among the northern American Indians such as the Ojibwa and Sioux. At first they assumed it came from intermarriage with modern Europeans. But the American X lineage turned out to be pre-Columbian, and its owners would have arrived in America either 15,000 or 30,000 years ago, depending on certain genetic assumptions.

The European X lineage seems to have originated in Western Asia around 40,000 years ago. Wallace suggests a part of this group may have made their way to America via Siberia, even though no traces of the X-lineage have yet turned up in eastern Asia. A transatlantic route is a possible alternative.

When modern humans first started to leave Africa, about 50,000 years ago by present reckoning, they probably consisted of small groups of hunter-gatherers a few hundred strong. In their determined exploration of the world before them, they must have overcome, with the primitive means at their disposal, the extreme rigours of climate, terrain and perhaps the archaic human populations such as the Neanderthals who had preceded them out of Africa.

Many of the biologists who are reconstructing the human past certainly believe their work has a value that transcends genetics. Most of the genetic differences in their lineage trees lie in the regions of DNA that do not code for genes and have no effect on the body. "We are all Africans at the Y chromosome level and we are really all brothers," Underhill says.

Wallace remarked that since he started working on mitochondrial DNA in the late 1970s: "What I have found astounding is that it clearly shows we are all one human family. The phylogeny in Africa goes back to the origins of our species, but the fingers of L3 are touching Europe and Asia, saying that we are all closely related."



参考译文

《创世纪》中提及到亚当和夏娃的3个孩子：该隐、亚伯和塞斯。但是通过调查世界各地人们的DNA序列，现在遗传学家已经确定，后裔的基因源自亚当和夏娃的18个女儿和10个儿子。

事实证明人类基因组对于历史学家和史前学家来说是一个全新且丰富的资料库，其范围从近代延伸到人类出现的早期。

DNA资料的研究者最近发现了史前人类从西亚迁移到北美的证据，证实这些人可能与人类祖先最接近，并且从根本上影响了历史学家长期拒绝接受的传言——托马斯·杰弗逊与其奴隶萨利·海明斯同属于一个祖先。

不像法医上用于鉴定个人DNA的检测，此处的DNA分析追溯到过去，通常集中在血统上，而非个人。生物学家往往能根据DNA数据中的序列估算出古代人口数量，甚至估算出一个种群从另一个种群中分离出来的大致时间。

尽管DNA能够解决一些历史问题，常通过在很大范围内进行亲子鉴定来操作，但是它最惊人的用处在于对史前的研究，从而为考古学在一无所知的基础上增添了一个新的考察角度。

到目前为止，最详细的家谱是由在亚特兰大埃默里大学医学院的道格拉斯·华莱士和他的同事花费多年时间构建起来的。华莱士创建的家谱以线粒体DNA为基础，线粒体DNA只是一些由卵细胞遗传物质构成的环状基因组，随后通过母系一脉相传。而相应基于Y染色体分析之上的男性家谱已经由斯坦福大学的皮特·安德希尔和皮特·奥弗纳着手构建了。

人口遗传学家们认为，人类祖先人口数量非常少，女性人数仅为2,000。但基于人类线粒体DNA的家谱并没有在人类祖先中追溯到上千名女性。这个家谱来源于一个人，即线粒体夏娃，因为其他所有的后裔都灭绝了。

对于Y染色体的家谱也同样如此，有一系列的事实证明在每一代中，都存在有人没有后代，或只有女儿，因此不同Y染色体的数量可能会逐步减少，即使人口数量维持不变。

遗传学家们认为，人类祖先生活在非洲某地，并在14.4万年后的某一段时间里开始分离，估计与实际相差1万年时间。

位于人类细胞内细胞核外的线粒体不会在各代人之间发生基因重组，并且母亲会把线粒体忠实地遗传给孩子。原则上，所有人在线粒体中都应有相同的DNA字串符。但实际上，因为复制偏差和辐射损伤，线粒体DNA在数百年里已经逐步地发生了变化。

当其中有些变化产生时，全球妇女的数量是稳定分布的，所以只有在特定的地区和大陆才发生一些变化。华莱士发现，几乎所有的美国印第安人都有属于由他命名为A，B，C和D谱系的线粒体。欧洲人则属于一套不同的谱系——他指定的是从H到K，从T到X的谱系。据华莱士计算，欧洲谱系的两个主要分支的分裂暗示了在3.9万年到5.1万年前，现代人类就到达了欧洲大陆，那个时间与考古学上发现的时间——至少在3.5万年以前正好相吻合。

在亚洲有一个已知的祖先谱系M，其后裔分支有E，F，G，同样，在美洲也发现有从A到D的谱系。

在非洲有一个已知单个主要谱系L，被分成3个分支。在东非，最年轻的分支L3很普遍，并且被认为是亚洲和欧洲谱系的来源。

许多正在重现古人类的生物学家坚信，他们的工作价值超越了遗传学。谱系图中大部分的遗传差异在于没有对基因进行编码且对人体不产生任何影响的DNA。昂德希尔说："在Y染色体层面，我们都是非洲人，而且我们都是真正的亲兄弟。"

华莱士表示，自从他20世纪70年代末开始研究线粒体DNA以来："一个惊人的发现是，这清楚地表明我们同属一个人类大家庭。非洲的种系发展史可以追溯到人类的起源，但L3的谱系涉及欧洲和亚洲，表明我们都是紧密相连的。"

核心词汇

lineage ['liniidʒ] *n.* 家系，血统
genetic [dʒi'netik] *adj.* 遗传的
genome ['dʒi:nəum] *n.* 基因组，染色体组
archive ['ɑ:kaiv] *n.* 资料；档案文件
prehistorian [ˌpri:hi'stɔ:riən] *n.* 史前史学家，史前学家
ancestral [æn'sestrəl] *adj.* 祖先的，祖传的
father ['fɑ:ðə] *vt.* 当……的父亲
forensic [fə'rensik] *adj.* 法院的，关于法庭的
paternity [pə'tə:niti] *n.* 父系，父系后裔
dimension [di'menʃən] *n.* 角度，范围
archaeology [ˌɑ:ki'ɔlədʒi] *n.* 考古学
mitochondrial [ˌmaitə'kɔndril] *adj.* 线粒体的
bequeath [bi'kwi:ð] *vt.* 遗赠，遗留
trace [treis] *vt.* 回溯，追溯
chromosome ['krəuməsəum] *n.* 染色体
nucleus ['nju:kliəs] *n.* 核
shuffling ['ʃʌfliŋ] *n.* 慢慢移动
calculate ['kælkjuleit] *vt.* 计算，考虑
transcend [træn'send] *vt.* 超越，优于
astounding [ə'staundiŋ] *adj.* 令人惊骇的
phylogeny [fai'lɔdʒini] *n.* 事物的发展史，种系发展史

Light Fantastic

21. 奇异之光

机经选粹

这一篇讲的是科学家利用折射做实验设置隐形装置。

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Light Fantastic

Increasingly, physicists are constructing materials that bend light the "wrong" way, an optical trick that could lead to sharper-than-ever lenses or maybe even make objects disappear.

Last October, scientists at Duke demonstrated a working cloaking device, hiding whatever was placed inside, although it worked only for microwaves.

In the experiment, a beam of microwave light split in two as it flowed around a specially designed cylinder and then almost seamlessly merged back together on the other side. That meant that an object placed inside the cylinder was effectively invisible. No light waves bounced off the object, and someone looking at it would have seen only what was behind it.

The cloak was not perfect. An alien with microwave vision would not have seen the object, but might have noticed something odd. "You'd see a darkened spot," said David R. Smith, a professor of electrical and computer engineering at Duke. "You'd see some distortion, and you'd see some shadowing, and you would see some reflection."

A much greater limitation was that this particular cloak worked for just one particular "color," or wavelength, of microwave light, limiting its usefulness as a hiding place. Making a cloak that works at the much shorter wavelengths of visible light or one that works over a wide range of colors is an even harder, perhaps impossible, task.

Nonetheless, the demonstration showed the newfound ability of scientists to manipulate light through structures they call "metamaterials."

Obviously the military would be interested

in any material that could be used to hide vehicles or other equipment. But such materials could also be useful in new types of microscopes and antennae. So far, scientists have written down the underlying equations, performed computer simulations and conducted some proof-of-principle experiments like the one at Duke. They still need to determine the practical limitations of how far they can bend light to their will.

The method is not magic, nor are the materials novel. Physicists are taking ordinary substances like fiberglass and copper to build metamaterials that look like mosaics of repeating tiles. The metamaterials interact with the electric and magnetic fields in light waves, manipulating a quantity known as the index of refraction to bend the light in a way that no natural material does.

"There are some things that chemistry can't do on its own," said John B. Pendry, a physicist at Imperial College London. "The additional design flexibility with introducing structure as well as chemistry into the equation enables you to reach properties that just haven't been accessible before."

When a ray of light crosses a boundary from air to water, glass or other transparent material, it bends, and the degree of bending is determined by the index of refraction.

Air has an index of 1. Water's index of refraction is about 1.3. That is why rippling water waves distort the view of a pond bottom, for instance. It is refraction that makes a straw in a glass of water look as if it is bending toward the surface, and fish swimming in a pond look closer to the surface than they really are.

Diamonds have a refractive index of 2.4, giving them their sparkling beauty.

For visible light, transparent materials like glass, water and diamonds all have an index of 1 or higher, meaning that when the light enters, its path bends inward, closer to the perpendicular. Because the index is uniform throughout a material, the bending occurs only as the light crosses a boundary.

But with metamaterials, scientists can now also create indexes of refraction from 0 to 1. In the Duke cloaking device, the index actually varies smoothly from 0, at the inside surface of the cylinder, to 1, at the outside surface. That causes the path of light to curve not just at the boundaries, but also as it passes through the metamaterial.

Metamaterials first took center stage in a scientific spat a few years ago over a startling claim that the index of refraction could be not just less than 1, but also negative, less than 0. Light entering such a material would take a sharp turn, almost as if it had bounced off an invisible mirror as it crossed the boundary.

The refractive index depends on the response of a material to electric and magnetic fields. Typically within a material, electrons flow in a way to minimize the effects of an external electric field, producing an internal electrical field in the opposite direction. But that is not universally true. For some metals like silver, an oscillating electric field induces a field in the same, not opposite, direction.

Victor G. Veselago, a Russian physicist, realized in the 1960s that if it were possible to find a material that responded in a

contrarian way not just to electric fields and but also magnetic fields, a result would be a negative index of refraction.

Dr. Pendry was among the first to start making metamaterials in the late 1990s, building a structure of thin wires that responded to electrical fields in a way opposite most materials. He also designed one that reacted similarly to magnetic fields.

Dr. Smith, then at the University of California, San Diego, attended a talk by Dr. Pendry at a conference in 1999. He and his colleagues built the first metamaterial to combine electric and magnetic behavior.

The journal Physical Review Letters rejected his scientific paper describing the experiment, considering it simplistic and uninteresting. Only then did Dr. Smith come upon Dr. Veselago's work on negative refraction and the larger implications of the experiment. "We had it, but we didn't realize it," said Dr. Smith, who is now at Duke. "Then I rewrote the abstract, and it was accepted."

That set off a contentious back and forth that lasted several years between researchers who made and measured negative-refraction metamaterials and those who said that the experiments showed nothing of the sort, that negative refraction was at best an illusion and violated the laws of physics.

Part of the difficulty in resolving the controversy was that the negative refra-ction experiments were at microwave wavelengths. Designing metamaterials for shorter wavelengths and higher frequencies like visible light is more difficult, because fewer materials are transparent at the higher frequencies.

"Just look around the room," Dr. Pendry said. "How many things can you see through? Not many. You're running out of road."

This year, researchers at the Ames Laboratory in Iowa and Karlsruhe University in Germany reported making a metamaterial that had a negative index of refraction for a visible wavelength.

Some critics remain unmollified. Nicolas Garcia of the Spanish National Research Council still calls Dr. Pendry's statements on negative refraction "propaganda." But today, most physicists accept the negative refraction interpretation.

The debate did highlight limits of metamaterials. They are dispersive, meaning the angle of refraction depends very sensitively on the frequency of light, and they are lossy, meaning that they absorb energy from the light as it passes through.

Nonetheless, Dr. Pendry has proposed that negative refraction materials can be used to make a "superlens" because they sidestep a process called diffraction that blurs images taken via conventional optics.

Researchers led by Xiang Zhang, a professor at the University of California, Berkeley, have demonstrated that a thin, flat piece of silver can indeed produce such images, able to resolve two thin lines separated by 70 billionths of a meter.

"You put your object on one side and your image will be projected on the other side," Dr. Zhang said.

The superlens can also preserve detail lost in conventional optics. Light is usually

thought of as having undulating waves. But much closer up, light is a much more jumbled mess, with the waves mixed in with more complicated "evanescent waves."

The evanescent waves quickly dissipate as they travel, and thus are usually not seen. A negative refraction lens actually amplified the evanescent waves, Dr. Pendry calculated, and that effect was demonstrated by Dr. Zhang's experiment. A negative refraction could someday lead to an optical microscope that could make out tiny biological structures like individual viruses.

The main limit now is that an object has to be placed very close to the lens, within a fraction of a wavelength of light.

Another possible use would be for a DVD-type recorder. The finer focus could allow more data like high-definition movies to be packed in the same space, perhaps the entire Library of Congress on a platter the size of today's DVD, Dr. Zhang said.

The metamaterials researchers also look for new problems to solve. "Now it's sort of fired up our imaginations to do this cloaking thing," Dr. Pendry said, "because we realized we could actually make one using these materials."

In May 2006, Dr. Pendry and Dr. Smith proposed a design that would cloak a single microwave frequency. By October, Dr. Smith's group at Duke demonstrated a working version, although simplified and imperfect. Dr. Smith's microwave design cannot be adapted to visible light, because the energy absorption problem becomes too great.

This year, Vladimir M. Shalaev of Purdue displayed a different design, avoiding the absorption problem. He said it would cloak visible light, albeit just a single wavelength at a time. "We can make our cloak for any of these colors but not for all of them simultaneously," Dr. Shalaev said. "At least, it starts looking like it's doable."

He said he hoped to build the design, which requires tiny rods arrayed around a cylinder, in a few years. Metamaterials could also be used for other novel devices. Dr. Shalaev suggested an "anticloak" that would trap light of a certain wavelength. "That could be used as a sensing device," he said.

Whether the cloak could be made big enough to cover a teenage wizard or an alien spaceship is another question. "I'm fairly pessimistic knowing what I know now," Dr. Smith said.

Dr. Shalaev said it would be a challenge. "I don't know," he said. "We hope it is possible." The Irresistible Fantasy of the Invisible Man, and Machine Humans have always dreamed of invisibility. Perseus, in Greek mythology, had a cap to make him disappear. Leprechauns and other magical creatures did it on their own.

In more recent times, invisibility has been a theme in fiction from *H. G. Wells* to *Harry Potter*. In *The Invisible Man*, Wells had a scientist change the refractive index of his own body. In *Harry Potter*, a cloak does the trick. In *The Lord of the Rings*, it is, of course, a ring that makes the wearer vanish, with some rather unpleasant side effects.

Both *Wonder Woman* and the Romulans

of *Star Trek* managed to make their flying craft invisible, and in the movie *Predator* an alien hunter used high technology to cloak itself, while Arnold Schwarzenegger, prey for once, went low-tech. He used cold mud to mask his body heat, making himself invisible to the alien in the infrared spectrum.



参考译文

物理学家们正在不断研制能使光线方向"错"弯的物质，这种光学戏法能使镜头空前清晰，甚至使物体凭空消失。

去年10月，科学家们在杜克大学展示了一组有效的遮罩装置，使放在里面的任何东西都隐身，虽然这个装置只适用于微波。

实验中，一道微波光经过一个特别设计的圆筒时分成了两股，在抵达另一端时又几乎毫无缝隙地合成了一股。这意味着，放在圆筒里的任何物体，根本就不会被看见。没有任何光波从物体上反射回来，注视它的人，只能看到它后面的东西。

这组遮罩装置仍然不够完美。利用微波看东西的生物，可能看不到物体，却可能会留意到奇怪的事物。杜克大学电气与计算机工程教授大卫·史密斯说："你会看到黑色的斑点，影像有点变形，还会有部分阴影，你也会看到一些投影。"

更大的限制是，这件特别的隐形衣只局限在某一特定的"色彩"或特定波长的微波，否则其隐形效果就会大打折扣。要制造出适用于波长更短的可见光或颜色范围更广泛的遮罩装置是一项更难、甚至是不可能的任务。

不管怎么样，这项实验展现了科学家借助所谓的"超材料"结构可以操纵光线的新方法。

毫无疑问，军方对任何能隐藏车辆或其他装备的材料极感兴趣。不过，在新型显微镜和天线方面，这种材料也十分有用。到目前为止，科学家已经写下基本的平衡等式，进行了电脑模拟，并做了像杜克大学那样的原理循证实验。对于何时能任意弯曲光线，他们仍然需要解决一些实际问题。

这种方法并不是具有什么魔力，所用的材料也并不新奇。物理学家利用诸如玻璃纤维和铜等普通材料，制造出外表像用马赛克拼凑出的瓷砖一样的超材料。这些超材料和光波内的电磁场相互作用，从而操作一种称为"折射率"的量，使光线以在天然材料里无法完成的方式折射。

"有些事并不是化学本身能够做到的，"伦敦大学帝国理工学院物理学家约翰·B.潘德瑞说："随着在公式中引入结构改变和化学反应，这种设计额外的灵活性能使你进入前所未有的领域。"

当一束光线从空气进入水中、玻璃或其他透明物质时会产生折射，折射度视折射率而定。

举个例子来说，空气的折射率为1，水的折射率约为1.3，这就是为什么荡漾的水波能扭曲池底的视觉。折射会使置入盛了水的玻璃杯中的吸管看起来向上弯，池中的鱼看起来离水面也比实际距离更近。

对可见光而言，透明材料像玻璃、水和钻石等的折射率都是1或更高，这就意味着光线射入时会向内折射以接近直角的角度。由于折射率在同一物质内都一样，所以



光只在穿越另一种介质时才会发生折射。

但现在随着超材料的使用，科学家也可以创造出介于0到1之间的折射率。在杜克大学的隐形装置内，实际上圆筒表面内缘的折射率可以从0顺利地变成表面外缘的折射率1。这不仅使光线在跨界时，而且在穿越超材料时，行进路径都会发生弯曲。

数年前，科学界争辩折射率不仅可以小于1，还可以是小于0的负数的惊世之论使超材料首度跃居舞台中心。光线进入这种物质时会急转弯，一跨越边界，就像撞到一面隐形镜子般被反射回来。

折射率由物质通过电磁场的反射决定。具有代表性的是，在一个材料里电子流为减小外界电场的影响，就会产生方向相反的内电场。但是这点并不具有普遍意义。对于某些金属来说，比如银，其震荡的电场是由同方向而不是反方向的电场组成的。

衰减波在传播过程中会很快消失，因而通常是看不到的。潘德瑞博士预测，负折射镜头事实上增强了衰减波。这种影响在张博士的实验中得以证明。有朝一日，利用负折射能造出一种光学显微镜，使微小的生物构造如个别病毒，纤毫毕现。

目前最主要的限制是，物体必须要放置在非常贴近镜头的地方，在光波的一个波段范围内。

另一可能的用途是制造DVD录影机。张博士说，更精细的聚焦，可在相同的空间储存更多资料，比如高画质电影，甚至能把整个国会图书馆的资料全部储存在一张DVD大小的光碟内。

最近，从威尔士到《哈里·波特》，隐形已经成了科幻电影的主题。在《隐形人》中，威尔士笔下的科学家能改变自己身体的折射率。在《哈里·波特》中，隐形衣变着戏法。在《指环王》中，可想而知，有着邪恶力量的戒指能使佩戴者消失。

《神奇女侠》以及《星球大战》中的罗慕伦人都设法使飞船隐形，在电影《铁血战士》中，外星掠夺者利用高科技将自己隐身。当阿诺德·施瓦辛格被捕后技术能量变低时，他用冰冷的泥土掩盖了自身散发的热量，隐身于外星人的红外光谱中。

核心词汇

bend [bend] *vt.* 弯曲
cloak [kləuk] *vt.* 遮盖，掩盖
cylinder ['silində] *n.* 圆筒，圆柱体
distortion [dis'tɔ:ʃən] *n.* 扭曲，变形
reflection [ri'flekʃən] *n.* 反射，反射光
metamaterial [metəmə'tiəriəl] *n.* 超材料
equation [i'kweiʃən] *n.* 方程(式)，等式
magic ['mædʒik] *adj.* 有魔力的
magnetic [mæg'netik] *adj.* 有磁性的
refraction [ri'frækʃən] *n.* 折光，折射
accessible [ək'sesəbl] *adj.* 可得到的，易接近的
straw [strɔ:] *n.* 稻草，吸管
pond [pɔnd] *n.* 池塘
perpendicular [.pə:pən'dikjulə] *adj.* 垂直的，直立的
spat [spæt] *n.* 小争吵
electron [i'lektrɔn] *n.* 电子
evanescent [.i:və'nesnt] *adj.* 逐渐消失的，容易消散的
dissipate ['disipeit] *vt.* 使……消散
virus ['vaiərəs] *n.* 病毒
platter ['plætə] *n.* 盘，碟
refractive [ri'fræktiv] *adj.* 折射的，有折射力的
wearer ['wɛərə] *n.* 穿用者，佩带者
vanish ['væniʃ] *vi.* 消失，不见了
infrare [.infrə'red] *adj.* 红外线的
spectrum ['spektrəm] *n.* 光谱

Ant and Tech

22.蚂蚁和技术

机经选粹

这一篇讲一种蚂蚁会对果树有好处。蚂蚁能杀死害虫，有利果树成长。

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题源全文

Ant and Tech

How weaver ants could come to the rescue of African mango farmers?

The humble but industrious ant has long served as a metaphor for the economic virtues of simplicity, parsimony and diligence. But in the case of weaver ants in Africa, this description may be more than just a metaphor. According to a study published in the latest issue of *the Journal of Economic Entomology*, by Paul van Mele of the Consultative Group on International Agricultural Research and his colleagues, African mango farmers could increase their harvests by as much as two-thirds with the help of these doughty insects.

Mangoes in Africa, as elsewhere, often fall prey to fruit flies, which destroy about 40% of the continent's crop. In fact, fruit flies are so common in African mangoes that America has banned their import altogether, to protect its own orchards. African farmers, meanwhile, have few practical means to defend their fruit. Chemical pesticides are expensive. And even for those who can afford them, chemical pesticides are not that effective since, by the time a farmer spots an infestation, it is too late to spray. Added to that, spraying tall trees is a much more complicated and unhealthy business than treating low-growing fruit and vegetables.

Agricultural scientists have also looked at controlling fruit flies with parasitic wasps. But the most common ones kill off only about one fly in 20, leaving plenty of survivors to go on the rampage. Lethal traps baited with fly-attracting pheromones are another option. But they, too, are expensive. Moreover, all these methods require farmers to detect the presence of fruit flies, and to identify them as the main

threat to their crop —no mean feat when most of the action is taking place in dense, leafy canopies ten metres off the ground. Instead, most farmers simply harvest their fruit early, when it is not yet fully ripe. This makes it less vulnerable to the flies, but also less valuable.

Farmers whose trees are teeming with weaver ants, however, do not need to bother with any of this. In a survey of several orchards in Benin, Dr van Mele and his colleagues found an average of less than one fruit-fly pupa in each batch of 30 mangoes from trees where weaver ants were abundant, but an average of 77 pupae in batches from trees without weaver ants. The weaver ants, it turns out, are very thorough about hunting down and eating fruit flies, as well as a host of other pests. The only drawback is the ants' painful bite, which can be avoided by harvesting fruit with poles, rather than climbing trees.

Weaver ants have been used for pest control in China and other Asian countries for centuries. The practice has also been adopted in Australia. But Dr van Mele argues that it is particularly suited to Africa since weaver ants are endemic to the mango-growing regions of the continent, and little training or capital is needed to put them to work. All you need do is locate a suitable nest and run string from it to the trees you wish to protect. The ants will then quickly find their way to the target. Teaching a group of farmers in Burkina Faso to use weaver ants in this way took just a day, according to Dr van Mele. Those farmers no longer use pesticides to control fruit flies, and so are able to market their mangoes as organic to eager European consumers, vastly increasing their income. Th e ants, so to speak, are on the march.



谦卑而勤劳的蚂蚁长期以来都被作为勤俭美德的象征——朴素、节俭、勤奋。但对非洲编织蚁来说，这种描述可能不仅仅是一种象征。根据国际农业研究磋商小组的保罗·范·美林洛尔和他的同事们发表在最新一期的《经济昆虫学》期刊上的一项研究成果显示，在这些勇敢的昆虫的帮助下，非洲芒果农民可以使他们的收成差不多增加2/3。

与其他地方一样，非洲的芒果常常是果蝇的腹中之物，果蝇摧毁了约40%的大陆作物。事实上，在非洲芒果里果蝇是如此普遍，以致美国为保护自己的果园，已经完全禁止它们的进口。同时，非洲农民几乎没有切实可行的方法来保护他们的水果。化学农药很昂贵。甚至对那些负担得起高昂费用的人来说，农药也不是那么有效，因为到农民发觉虫患成灾时，再去喷洒农药为时已晚。除此以外，给高大的树木喷洒农药比给低矮的水果和蔬菜喷洒农药要复杂得多，也更有害健康。

农业科学家们还寄希望于靠寄生蜂来控制果蝇。但最常用的寄生蜂只能杀死约1/20的果蝇，剩下来的大量幸存的果蝇继

续猖獗地活动。以吸引果蝇的信息激素为诱饵的致命陷阱则是另一种选择。但它们也很贵。此外，所有这些方法需要农民去发现出现的果蝇，并确定它们是作物的主要威胁——当大部分的行动是发生在离地面10米的浓密而多叶的树荫里，就算是丰功伟绩了。而与此不同的是，大多数农民只是提早收获了水果，而此时水果尚未完全成熟。这虽使它们比较不易受到果蝇的攻击，但也减少了它们的价值。

但那些树上有很多编织蚁的农民一点也不需要为这烦恼。对几个位于贝宁的果园的调查中，范梅尔博士和他的同事们发现，在有大量编织蚁的树上，每30个芒果上的果蝇蛹平均不到1个，但在没有编织蚁的树上，却平均有77个果蝇蛹。原来，编织蚁可以彻底地捕获果蝇并吃掉它们，而且它也是其他害虫的宿主。唯一美中不足的是，编织蚁咬人很痛，但收获水果时，可以通过用竿来代替爬到树上的方法来避免。

数百年来，在中国和其他亚洲国家，编织蚁已被用于虫害控制，这种方法也已经在澳大利亚得到采用。但范梅尔博士认为，它特别适用于非洲，因为编织蚁是非洲芒果生长区域的地方性产物，不需要很多的训练或资金就可以把它们用于工作之中。你要做的只是找到一个合适的巢，在它和你想要保护的树之间系上绳子，然后编织蚁会迅速找到到达目标的路。据范梅尔博士说，只用1天的时间就可以教会布基纳法索的一群农民用这种方式使用编织蚁。这些农民不再使用农药来控制果蝇，这样，农民就能向迫不及待的欧洲消费者完全地推销他们的芒果，这大大地增加他们的收入。编织蚁可说是正在行进中。

核心词汇

humble ['hʌmbl] *adj.* 卑下的，谦逊的
industrious [in'dʌstriəs] *adj.* 勤劳的，勤奋的
parsimony ['pɑːsiməni] *n.* 过度节俭，吝啬
doughty ['dauti] *adj.* 勇敢的，刚强的
spray [sprei] *vt.* 喷雾，喷射
unhealthy [ʌn'helθi] *adj.* 不健康的
rampage ['ræmpeidʒ] *n.* 暴怒
harvest ['hɑːvist] *vt.* 收割，收获
ripe [raip] *adj.* 成熟的
teeming ['tiːmiŋ] *adj.* 丰富的
bother ['bɔðə] *vt.* 烦扰
abundant [ə'bʌndənt] *adj.* 丰富的，充裕的
endemic [en'demik] *adj.* 风土的，地方的
capital ['kæpitəl] *n.* 资产
vastly ['vɑːstli] *adv.* 广大地，许多
income ['inkəm] *n.* 收入，所得

Fossils Offer Support for Meteor's Role in Dinosaur Extinction

23. 流星导致恐龙灭绝？化石提供相关证据

机经选粹

这一篇讲的是对恐龙灭绝的研究，讲到彗星还是流星可能在地球上撞了一个大洞，导致了恐龙灭绝。

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Fossils Offer Support for Meteor's Role in Dinosaur Extinction

Courtesy of Dr. Laia Alegret

Tiny fossil creatures found in Cuba, notably foraminifera, date from 65 million years ago, the end of the Cretaceous period. At right, shells surround material from fireball.

No guns materialized. Even so, the scientists kept a low profile while digging, eager to avoid security forces from the nearby air base—an important military site that helped provoke the Cuban missile crisis. The diggers had no permit and no interest in being asked to explain their presence.

In the end, they found rare fossils that are shedding new light on what wiped out the dinosaurs at the end of the Cretaceous period 65 million years ago.

For more than a decade, the standard view has envisioned a speeding object from space that crashed into the earth and kicked up enough dust and rock around the globe to blot out the sun. The smoking gun seemed to be the discovery beneath the Yucatán

peninsula of Mexico of a 110-mile-wide crater called Chicxulub, after a nearby town.

But lately, doubters have argued that Chicxulub formed 300,000 years before the mass extinction—too early to have played a role in the demise of the dinosaurs and hundreds of other plant and animal species that vanished at the end of the Cretaceous.

The team of scientists zeroed in on Cuba as an ideal place to seek clues, having heard from Cuban colleagues of a possible trove of fossils of the right age. The Cuban zone was 600 miles from the Mexican crater.

Now, in the September issue of *Geology*, the scientists, from Spain, Cuba and Mexico, report that they have discovered a highly disturbed bed of fossils that bears numerous signatures of Chicxulub's mayhem. The date of the disturbance, 65 million years ago, is exactly at the end of the Cretaceous.

"It's basic" to resolving the debate, Laia Alegret, a team geologist at the University of Zaragoza in Spain, said in an interview. "But it was difficult. The site is located opposite a military base. So it's almost impossible to get a work permit."

The discovery was outside Santa Clara, a city in central Cuba whose nearby air base drew scrutiny in 1962 when American spy planes spotted Soviet jets and antiaircraft missiles. It turned out that the base held Soviet bombers and a half-dozen atom bombs.

"It was definitely a hot spot," said Timothy Naftali, a cold war historian at the University of Virginia.

Starting around 2000, Dr. Alegret and her European colleagues repeatedly sought work permits for a nearby hill but always met with stultifying delays, if not outright rejections. Finally, they slipped into the site with their Cuban colleagues, going in late 2000, 2002 and 2003. At other times, the Cubans went in alone.

A rocky outcrop on the hill showed an exposed bed of sedimentary rock made up of broken bits of minerals and fossils. It was more than 30 feet thick. The team took 66 samples. Examination with microscopes showed numerous signs of cosmic violence, including quartz deformed by high temperatures and pressures, as well as tiny spheres of glass, both clearly debris from a spectacular fireball.

Microscopic study also revealed the presence of thousands of tiny fossil creatures, most especially foraminifera. Those one-celled animals have a bewildering array of minuscule shells. Forams, as they are known, evolve so fast that geologists, paleontologists and oil companies use their shifting appearance as reliable guides to geologic dating.

"They told the age of the sediments," Dr. Alegret said. "So we've definitely confirmed the age of these deposits."

At the end of the Cretaceous, the rocky bed now in Cuba formed on the ocean bottom at a depth of perhaps 3,300 feet, over a few days or weeks as tons of debris rained down from the sky and huge waves generated by the Chicxulub event washed land out to sea.

"It was geologically instantaneous," Dr. Alegret said of the deposit's formation.

Earth movements over the ages turned that part of the seabed into land.

Dr. Alegret's co-authors include Ignacio Arenillas, José A. Arz, Alfonso Meléndez, Eustoquio Molina and Ana R. Soria of the University of Zaragoza; Consuelo Díaz of the Institute of Geology and Paleontology in Havana; José M. Grajales-Nishimura of the Mexican Institute of Petroleum in Mexico City; and Reinaldo Rojas of the National Museum of Natural History in Havana.

Dr. Alegret said that because of the site's importance, her Cuban colleagues were talking with the government to have it protected from rain and erosion. The aim is to save the outcrop for scientific study.



参考译文

并没有枪抵着。即便如此，科学家们在挖掘的时候还是保持着低姿态，希望不要惊动来自附近的空军基地——一个煽动古巴导弹危机的重要军事基地——的安全部队。挖掘者们没有得到许可，也无意解释他们在此的原因。

最后，他们发现了这些罕见的化石，彻底揭开了6,500万年前的白垩纪末期恐龙灭绝之谜。

十多年来，对恐龙灭绝的标准解释是：想象宇宙中一个超速飞行的物体撞向地球，在全球范围内扬起大量的灰尘，遮蔽了太阳。在墨西哥尤卡坦半岛低洼处发现了一个110英里宽的陨石坑——希克苏鲁伯陨石坑(根据周边的一个小镇命名)。这似乎就是标准解释中所说的始作俑者了。

然而最近，持怀疑态度的人争论说，希克苏鲁伯陨石坑是在大型灭绝发生的30万年前产生的——对于在白垩纪末期就灭绝的恐龙和消失的数百种其他动植物物种来说，此现象发生的时间过早，不可能对其产生什么影响。

科学家团队将注意力集中在古巴，将其作为寻找线索的理想之地，他们从古巴同事那儿听说在古巴可能发现了该时期的化石。古巴地区离墨西哥陨石坑600英里。

如今，在《地质学》杂志9月刊上，来自西班牙、古巴和墨西哥的科学家们报道说他们已经发现了一个极度混乱的化石层，其中有大量的希克苏鲁伯陨石坠落时大混乱的痕迹。混乱发生的时间，是6,500万年前，正是白垩纪末期。

在一次采访中，西班牙萨拉戈萨大学的一个合作地质学家拉娅·阿莱格雷特说，要解决争论是“基本的，但也是困难的。化石发现地在一个军事基地的对面，所以这项工作要得到许可是不可能的。”

化石是在古巴中部的城市圣克拉拉外发现的。1962年，美国间谍飞机侦查苏联喷气式飞机和防空导弹之时，这个城市附近的空军基地就开始严密检查异常情况了。这个基地被证实拥有苏联轰炸机和半打原子弹。

“这一定是一场扣人心弦的侦查活动，”弗吉尼亚大学冷战历史学家蒂莫西·纳夫塔利说。

2000年左右，阿莱格雷特博士和她的欧洲同事就开始为考察一个附近的小山一次又一次地申请在当地工作的许可证，

但一直以来，不是因为被拖延就是被断然拒绝而徒劳无功。最终，在2000年、2002年、2003年年末，他们和古巴同行一起偷偷溜到了化石所在地进行考察。其他几次都是古巴的科学家们单独去的。

小山上一块岩石的一角露出了地表，向人们展示了由矿物和化石的碎片组成的沉积岩层。这个岩石层有30英尺厚。队员们取了66个样本。把样本放在显微镜下观测，结果显示存在大量曾有宇宙力量冲击的迹象，包括由高温和压力造就的变形的石英，以及一些微小的玻璃球，它们明显都是一个壮观的大流星的残骸。

显微镜下的研究也揭示了上千种微型化石生物的存在，特别是有孔虫目生物。这些单细胞生物长着一系列奇怪的细小盔甲。这种叫做有孔虫的生物的进化是如此之快，以至于地质学家、古生物学家和石油公司将它们变换的外表当作是确定可靠地质年代的指南。

“这些虫子显示了沉淀物所处的时代，”阿莱格雷特博士说：“所以我们已经能完全确定这些沉积物的形成年代。”

在白垩纪末期希克苏鲁伯陨石事件中，连续数天或数周内成吨的碎片从天空中如大雨般散落，它形成的巨大波涛将岸上的泥土冲入大海，其间，古巴现在的岩石层在大约3,300英尺深的海底形成了。

阿莱格雷特博士谈到沉淀物的形成时说道：“在地质学上，这是一瞬间发生的。”

多年的地壳运动将那片海床的一部分变成了陆地。

阿莱格雷特博士的合作者包括萨拉戈萨大学的伊格那西奥・阿里尼亚斯、何西・A・阿尔兹、阿方索・梅兰德兹、优斯通奎・莫利纳和安娜・R・索瑞亚、哈瓦那地质古生物研究所的康斯薇洛・迪亚兹、墨西哥城墨西哥石油学会的何西・M・格拉哈莱斯和哈瓦那国家自然历史博物馆的雷纳尔多・罗杰斯。

阿莱格雷特博士说，由于此地区的重要性，她的古巴同行正与当地政府进行交涉，以防止它被雨淋和侵蚀。他们的目标是将这块裸露的岩石保留下来做科学研究。

核心词汇

foraminifera [fəˌræmiˈnifərə] *n.* 有孔虫类
provoke [prəˈvəuk] *vt.* 激怒，惹起
doubter [ˈdautə] *n.* 持怀疑态度者
trove [trəuv] *n.* 被发现的东西，贵重发掘物
crater [ˈkreitə] *n.* 弹坑，陨石坑，火山口
mayhem [ˈmeihem] *n.* 大混乱，大破坏
antiaircraft [ˌæntiˈɛəkrɑːft] *adj.* 对空的，防空的
stultifying [ˈstʌltifaiiŋ] *adj.* 极其单调乏味的，使人变迟钝的
outright [ˈautˈrait] *adj.* 率直的，断然的
outcrop [ˈautkrɔp] *vt.* 露出地面，出现
sedimentary [sediˈmentəri] *adj.* 沉积的，沉淀性的
quartz [kwɔːts] *n.* 石英
minuscule [miˈnʌskjuːl] *adj.* 极小的，微小的
geologic [dʒiəˈlɔdʒik] *adj.* 地质的，地质学上的
instantaneous [ˌinstənˈteinjəs] *adj.* 瞬间的，即刻的
seabed [ˈsiːbed] *n.* 海底，海床
paleontology [ˌpæliɔnˈtɔlədʒi] *n.* 古生物学

The Steller's Sea Cow

24. 斯特拉海牛

机经选粹

这篇文章大概说的是海里的一种动物(海牛)。文章对它的习性、特点进行了描述。还提到了1992年大危机前它们的数量很多，现在却很少了，现在人们开始采取措施保护它们。

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The Steller's Sea Cow

To the crew of Vitus Bering's ship St. *Peter*, shipwrecked off the coast of Kamchatka in early November 1741, the huge, easily-hunted sea cow was a godsend that helped most of them to survive and return home. Within 3 decades, though, their countrymen had hunted sea cows to extinction.

Steller's sea cows were the largest, and the only cold-water members of the scientific order *Sirenia*, to which manatees and dugongs also belong. Although they look rather like whales or sea lions, the order's closest relatives are elephants and hyrax. Feeding on sea grasses (in the case of the Steller's sea cow, primarily kelp), they are the only aquatic herbivorous mammals. Historically, about 1,500~2,000 members of the species known taxonomically as *Hydrodamalis gigas* ("giant sea calf") lived in the shallow waters off the coasts of Alaska and the Russian Far East, centred in the Commander Islands. Although they undoubtedly faced some hunting pressure from the Aleut and Eskimos, both of whom were expert whalers, their population was probably quite stable.

Georg Wilhelm Steller, the naturalist and physician on Bering's expedition, recorded the first, and best, descriptions of the sea cow. They were up to 28 feet long, and weighed as much as 7~8 tons; drifting just below the surface, they were often mistaken for overturned boats. With a heavy bone stucture, they had huge midsections, a disproportionately small head, and a large, flat, twin-lobed tail. The wrinkly black hide was about an inch thick and very tough, covering a fat layer

between 4 and 9 inches thick—the combination provided protection from the cold, pounding by surf, and rubbing against ice and rocks. It did not provide sufficient protection from Russian weapons, though—only one out of five sea cows hit by harpoon or rifle fire was retrieved, but the majority escaped only to die at sea from their injuries.

Their external ear openings were only about the size of a pea, but the internal ear bones were very large, so excellent hearing can be assumed, although when they were feeding, they would completely ignore even a boat. Steller sometimes described the sea cow as if they were farm animals:

These animals, like cattle, live in herds at sea, males and females going together and driving the young before them about the shore. They are occupied with nothing else but their food. The back and half the body are always seen out of the water. They eat in the same manner as the land animals, with a slow forward movement. They tear the seaweed from the rocks with the feet and chew it without cessation... During the eating they move the head and neck like an ox, and after the lapse of a few minutes they lift the head out of the water and draw fresh air with a rasping and snorting sound after the manner of horses.

During the ten months that Steller and the other survivors of Bering's crew spent on what would later be named Bering Island, Steller was able to gather considerable information on the habits of the sea cow, as well as an extensive set of measurements of various parts of the sea cow's anatomy, allowing scientists to reconstruct the animal around skeletons that have survived. Hans Rothauscher has posted an excellent site, in both English and German, showing the progression and possible errors in such reconstructions of the sea cow.

The meat of the sea cow, which was most often referred to as being similar to veal, remained fresh for much longer than any other available meat source, making it extremely valuable to the Russian sailors and hunters. The fat was described as tasting like sweet almond-oil. Although Bering's crew only killed their first sea cow six weeks before their escape in August 1742, the meat was crucial in restoring their strength during the final stages of building a new boat from the wreckage of the *St. Peter*. When they left, they took a supply of meat and fat, and stories of the incredible riches of the islands for fur hunters. Those hunters flocked to the area, and in 1768, explorer Martin Sauer entered in his journal an account of the death of the last known sea cow.

Manatees and dugongs are of worldwide conservation efforts to ensure that they don't share the fate of the Steller's sea cow. There is still a chance, though, that the sea cow isn't extinct. In the years since their generally-accepted extinction in 1768, there

have been occasional reports suggesting that small colonies may have survived by moving to areas away from the Russian hunting grounds. In the mid-1800s, such reports were not unusual, and as recently as 1962, the crew of a Russian whaler reported seeing six animals that resembled sea cows, feeding in a bay in the Gulf of Anadyr. In 1977, a fisherman in Kamchatka reported actually touching a drifting animal that matched the description of a sea cow. But for now, those reports are just considered to be rumours, fuel for yet another Northern myth.



1741年11月初维特斯·白令之船——"圣·彼得"号在堪察加半岛海岸遇难，对于其所有船员而言，巨大而易被狩猎的海牛就是天赐之物。在其帮助下，船上大部分人员有幸生还。然而，在不到30年间，他们的同胞已经大量猎杀海牛，致使它们濒临绝灭。

斯特拉海牛是自然科学界海牛目中最大，也是唯一在冷水中生存的成员，海牛和儒艮也属于此类。尽管它们外形看起来颇似鲸和海狮，但是与该海牛科亲缘关系最近的要数大象和岩狸。它们以海草为食(就斯特拉海牛来说，主要食用一种大海草)，是唯一的水生食草性哺乳动物。在历史上，这种在分类学上称为无齿海牛(巨大的海上小牛)的物种，大约有1,500~2,000只生活在阿拉斯加和俄罗斯远东地区的浅水域沿岸，集中在司令群岛。尽管它们毫无疑问会面临来自阿留申人和爱斯基摩人——他们都是捕鲸专家——的狩猎压力，但是其数量很可能还是相当稳定的。

在白令探险队中，身为自然科学工作者和医生的乔治·威廉·斯特拉最早并最佳地记载了对大海牛的描述。它们长达28英尺，重达7~8吨，只漂浮在水面下，因此经常被误认为是倾覆的船只。它们的骨骼结构很笨重，中躯庞大，头小并与身体不成比例，尾大而平，成双叶状。皮层约有1英寸厚，呈黑色，有皱纹，并且非常坚硬，覆盖着一层4~9英尺厚的脂肪层——为抵御寒冷、海浪的冲击及冰和岩石的摩擦提供保护。但是，这样的皮肤仍无法抵挡俄罗斯人的武器。尽管被渔叉和步枪击中的海牛只有1/5被猎回，但是逃走的海牛大部分也会因其伤不愈而死在海里。

它们的外耳开口只有约一颗豌豆大小，但是其内部耳骨异常庞大。因此，它们被认为有极佳的听觉，尽管在觅食时它们可能会完全忽视一条船的经过。斯特拉有时候把大海牛形容成农场动物：

这些动物像牛一样，成群地生活在海上。雄性和雌性一起并肩驱赶海岸附近在它们前面的小海牛。除了觅食之外，他们逍遥自在地漂浮在海上。总能在水面上看到其背部和半个身体。进餐时，它们和陆地动物一样缓慢前行，用脚把海草从岩石撕裂出来，并不停地咀嚼……像牛一样移动头和脖子，几分钟以后，从水中抬起头来呼吸新鲜空气，像马一样发出刺耳的喷鼻声。

在斯特拉和白令探险队的其他幸存者于后来被命名为白令岛的岛上逗留的10个月中，

斯特拉能够收集相当多的信息。这些信息涉及海牛的习性，以及解剖海牛各个部分的大量的测量值，这为科学家能重建还存活的海牛的骨骼提供了依据。汉斯·罗切斯特发布了一个影响很大的网站，用英语和德语介绍这种重建上的进展，以及可能出现的失误。

通常认为大海牛的肉颇似小牛肉，而且比其他肉类的新鲜期更长，这使得它对于俄罗斯水手和猎人来说都极其宝贵。据描述，其脂肪尝起来像甜杏仁油。虽然白令探险队的船员在1742年8月脱离困境之前的6周杀了第一头海牛，但是在“圣·彼得”残骸中建造一条新船的最后阶段，肉对他们恢复精力具有决定意义。当他们离开时，带走了一批肉和脂肪，还告知毛皮猎人岛上具有令人难以置信的财富。那些猎人成群地涌向此岛。1768年，探险家马丁·绍尔在他的日志中记载了最后一头已知的大海牛的死亡。

海牛和儒艮现是全球生态努力保护的焦点，以保证它们不会重蹈斯特拉海牛命运的覆辙。尽管大海牛仍然有存在的迹象。自从1769年普遍公认它们已灭绝，这些年中偶尔有报道显示，少量的群体可能已经移居到远离俄罗斯狩猎场的地方，从而存活下来。19世纪中期，这种报道漫天遍地。在最近的1962年，一组俄罗斯捕鲸队的船员报告说，看见类似于大海牛的6头动物在阿纳德尔湾进食。1977年，堪察加半岛的一名渔民报告说，实际上他还触摸过一头与海牛的描述相符的正在漂浮的动物。但是迄今为止，这些被视作传闻的报道仅是书写的另一部北欧神话。

核心词汇

shipwreck ['ʃiprek] *v.* 遇海难，船失事
godsend ['gɔdsend] *n.* 天赐之物，意外获得的幸运
cow [kau] *n.* 母牛
manatee [mænə'ti:] *n.* 海牛
dugong ['dju:gɔŋ] *n.* 儒艮
hyrax ['haiəræks] *n.* 岩狸
whaler ['hweilə(r)] *n.* 捕鲸者，捕鲸船
stable ['steibl] *adj.* 稳定的，安定的
midsection [mid'sekʃən] *n.* 中央部分，中躯
disproportionately [disprə'pɔ:ʃənətli] *adv.* 不成比例地
surf [sə:f] *n.* 海浪
cessation [sə'seiʃən] *n.* 停止
rasping ['rɑ:spiŋ] *adj.* 刺耳的，锉磨声的
snort [snɔ:t] *vi.* 哼着鼻子
survivor [sə'vaivə] *n.* 幸存者
progression [prə'greʃən] *n.* 前进，发展
error ['erə] *n.* 错误，过失
veal [vi:l] *n.* 小牛肉
available [ə'veiləbl] *adj.* 可用的，有效的
wreckage ['rekidʒ] *n.* 失事，破坏
fisherman ['fiʃəmən] *n.* 渔夫
rumour ['ru:mə] *n.* 谣言，传闻

Warbling Whales Speak a Language All Their Own

25. 鲸用自己的语言歌唱

机经选粹

这一篇讲的是鲸鱼文化及语言。开始讲述了一种鲸的交流方式，说它们在不同的时间交流的方式都不同，不同群落之间也不同，最后引出问题。后来又讲述了killer whale，其中分两种：resident killer whale 和另一种。分别说了它们的区别，得出结论：每个群落都有自己独特的语言。接着又叙述了有个科学家研究发现了不同海域的鲸可以听懂不同语言的鲸，他否认这是基因问题，也反驳其他的结论。最后简述了鲸鱼的智慧和进化问题。

阅读题源

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Warbling Whales Speak a Language All Their Own

The songs of the humpback whale are among the most complex in the animal kingdom. Researchers have now mathematically confirmed that whales have their own syntax that uses sound units to build phrases that can be combined to form songs that last for hours.

Until now, only humans have demonstrated the ability to use such a hierarchical structure of communication. The research, published online in the March 2006 issue of the Journal of the *Acoustical Society of America*, offers a new approach to studying animal communication, although the authors do not claim that humpback whale songs meet the linguistic rigor necessary for a true language.

"Humpback songs are not like human language, but elements of language are seen in their songs," said Ryuji Suzuki, a Howard Hughes Medical Institute (HHMI)

predoctoral fellow in neuroscience at Massachusetts Institute of Technology and first author of the paper.

With limited sight and sense of smell in water, marine mammals are more dependent on sound—which travels four times faster in water than air—to communicate. For six months each year, all male humpback whales in a population sing the same song during mating season. Thought to attract females, the song evolves over time.

Suzuki and co-authors John Buck and Peter Tyack applied the tools of information theory—a mathematical study of data encoding and transmission—to analyze the complex patterns of moans, cries, and chirps in the whales' songs for clues to the information being conveyed. Buck is an electrical engineer who specializes in signal processing and underwater acoustics at the University of Massachusetts Dartmouth, and Tyack is a biologist at Woods Hole Oceanographic Institution in Massachusetts.

Suzuki, who began the project as an electrical engineering undergraduate at the University of Massachusetts, Dartmouth, worked with Buck and Tyack to develop a computer program to break down the elements of the whale's song and assign an abstract symbol to each of those elements. Suzuki wanted to see if he could design a computer program that enabled scientists to classify the structure of the whales' songs.

He used the program to analyze structural characteristics of the humpback songs recorded in Hawaii. To measure a song's complexity, Suzuki analyzed the average amount of information conveyed per symbol. He then asked human observers who had no previous knowledge of the structure of the whale songs to classify them in terms of complexity, redundancy, and predictability. The computer-generated model and the human observers agreed that the songs are hierarchical, confirming a theory first proposed by biologists Roger Payne and Scott McVay in 1971.

Suzuki said that information theory also enabled the researchers to determine how much information can be conveyed in a whale song. Despite the "human-like" use of hierarchical syntax to communicate, Suzuki and his colleagues found that whale songs convey less than one bit of information per second. By comparison, humans speaking English generate 10 bits of information for each word spoken. "Although whale song is nothing like human language, I wouldn't be surprised if some marine mammals have the ability to communicate in a complex way," said Suzuki. "Given that the underwater environment is very different from our world, it is not surprising that they would communicate in rather a different way from land mammals."

The structure of the humpback whale song is repetitive and rigid. The whales repeat unique phrases made up of short and long segments to craft a song. There are multiple layers, or scales, of repetition, denoted as periodicities. One scale is made up of six units, while a longer one consists of 180~400 units. The combined

periodicities give the song its hierarchical structure.

Suzuki compared his new technique for animal communication research with more traditional models, such as the first order Markov model that is used to analyze bird songs, which are often shorter and simpler in structure than humpback whale songs. The Markov model proved inadequate for the whale song's complex structure.

Information theory, in contrast, proved perfect for analyzing humpback whale songs because it provided a quantitative analysis of the complexity and structure of the songs. "Information theory was the right choice because it allows one to study the structure of humpback songs without knowing what they mean," said Suzuki.

"I hope that knowing the hierarchical structure in humpback songs will inform research in other fields, such as evolutionary biology," said Suzuki. The technique he developed is already being used by a postdoctoral fellow in Buck's laboratory to analyze recently recorded songs of humpback whales from Australia.



座头鲸的歌声是动物王国中最为复杂的声音之一。研究者们现已十分地确信这些鲸拥有自己的句法系统，它们将声音单元构筑成可以组合成歌曲的短句，此歌曲可以持续数小时。

到目前为止，只有人类才显示出这种使用层次结构交流的能力。在2006年3月《美国声学界》杂志网上发表的一项研究中，尽管作者并没有提出座头鲸之歌符合一种语言所必需的严格的语言规范，但这项研究提出了一种研究动物交流的新方法。

来自麻省理工学院神经学系的霍华德·休斯医学研究会(HHMI)的博士前研究员——铃木隆司说道："尽管座头鲸的歌声并不像人类的语言，但其中还是可以发现语言元素的存在。"他还是此论文的第一作者。

由于在水里有限的视力和嗅觉能力，海洋哺乳动物更多地依赖于用声音进行交流——声音在水中的传播速度是空气中的4倍。一年中有6个月，一个族群中的所有雄性座头鲸在交配季节都唱着同一首歌。人们认为这歌声是用来吸引雌性的。过了那段时间，歌声也会发生变化。

铃木和论文合著者约翰·巴克、皮特·泰益克借助信息理论方法——一种针对数据编码和传输进行的数学研究——分析座头鲸歌声中的呻吟、呼喊、唧唧声等各种复杂形式，以探寻各种叫声所传递的信息。巴克是一位电气工程师，他在麻州大学达特茅斯分校专攻信号处理和水声学。泰益克是美国马塞诸塞州伍兹霍尔海洋生物研究所的一名生物学家。

当铃木还在麻州大学达特茅斯分校读电机工程专业的本科生时，他就开始研究这个

项目了。当时，他和巴克、泰益克一起开发了一个计算机程序用来分解座头鲸歌声中的各种元素，然后给每个元素制定一个抽象的记号。铃木想知道他能不能设计出一个计算机程序，能够帮助科学家用这个程序给座头鲸歌声的结构进行归类。

他用这个程序分析了在夏威夷录制的座头鲸歌声的结构特点。为了测量一首歌的复杂性，铃木分析了每个符号平均传递的信息量。然后，他让一些之前毫不了解座头鲸歌声结构的观测员根据复杂程度、冗余性和可预测性来将歌声结构分类。电脑生成的模型和观测员的分类结果一致表明：座头鲸的歌声是分层次的。这一结果也证实了生物学家罗杰·佩恩和斯科特·麦克威法在1971年首次提出的理论。

铃木说信息理论还能使研究者确定座头鲸的一首歌中传递的信息量有多少。除了有与人类相似的能够使用分层句法结构进行交流的能力外，铃木隆司和他的同事们还发现座头鲸歌声中每秒所传递的信息不到1比特(信息单位，以在两种可能性之间的一种选择表示)。相比之下，人类说英语时，每个单词所含的信息量可达到10比特。铃木隆司说："虽然座头鲸的歌声跟人类语言一点都不像，但是如果有些海洋哺乳动物能够用复杂的方式进行交流，我也并不感到奇怪。因为水下环境跟我们所处的环境迥然不同，他们交流的方式与陆地上的哺乳动物相差很大也不足为奇。"

座头鲸歌声的结构是重复不变的。它反复吟唱由短音和长音构成的独特片段，从而构成了一首歌。周期性重复的层次或等级是多种多样的。一个等级是由6个单位组成的，而长一点的可以包含180~400个单位。这种混合的周期性就构成了歌声的层次结构。

铃木将自己在研究动物交流问题方面的新技术与更多传统的研究模式进行了一番比较，比如第一个用来分析鸟鸣声的马尔可夫模式。鸟的歌声在结构上往往要比座头鲸的歌声简短些。实验证明，要想分析座头鲸歌声的复杂结构，仅用马尔可夫模式是不够的。

相反，信息理论则被证明是分析座头鲸歌声的绝好方法。因为它能对歌声的复杂性和结构进行定量分析。铃木说："采用信息理论法进行研究是正确的选择，因为它使研究人员在不知道座头鲸歌声所代表的意思前就能研究它的结构。"

铃木说："我希望，对座头鲸歌声分层结构的了解能为其他领域的研究提供一些信息，比如进化生物学领域。"巴克实验室的一位博士后研究员正用铃木开发出来的这一技术来研究最近在澳大利亚录制的座头鲸的歌声。

核心词汇

humpback ['hʌmpbæk] *n.* 座头鲸
syntax ['sintæks] *n.* 句法
linguistic [liŋ'gwistik] *adj.* 语言的，语言学的
rigor ['rigə] *n.* 严格，严密
predoctoral [pri:'dɔktərəl] *adj.* 博士前的
encoding [in'kəudiŋ] *n.* 编码
moan [məun] *n.* 呻吟
acoustic [ə'ku:stik] *n.* 音响学，音响效果
engineering [ˌendʒi'niəriŋ] *n.* 工程学，工程技术
redundancy [rɪ'dʌndənsi] *n.* 冗余，多余
repetitive [ri'petitiv] *adj.* 重复的，反复的，不变的
inadequate [in'ædikwit] *adj.* 不充分的，不适当的
quantitative ['kwɔntitətiv] *adj.* 数量的，定量的
postdoctoral [ˌpəust'dɔktərəl] *adj.* 博士后的

Taking Play Seriously

26. 严肃认真地对待游戏

机经选粹

这是一篇讲玩耍与大脑关系的文章。

阅读题源



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Taking Play Seriously

The success of *The Dangerous Book for Boys*—which has been on the best-seller list for the last nine months—and its step-by-step instructions for activities like folding paper airplanes is testament to the generalized longing for play's good old days. So were the questions after Stuart Brown's library talk; one woman asked how her children will learn trust, empathy and social skills when their most frequent playing is done online. Brown told her that while video games do have some play value, a true sense of "interpersonal nuance" can be achieved only by a child who is engaging all five senses by playing in the three-dimensional world.

This is part of a larger conversation Americans are having about play. Parents bobble between a nostalgia-infused yearning for their children to play and fear that time spent playing is time lost to more practical pursuits. Alarming headlines about U.S. students falling behind other countries in science and math, combined with the ever-more-intense competition to get kids into college, make parents rush to sign up their children for piano lessons and test-prep courses instead of just leaving them to improvise on their own; playtime versus resume building.

Discussions about play force us to reckon with our underlying ideas about childhood, sex differences, creativity and success. Do boys and girls play differently? Are children being damaged by staring at computer screens and video games? Are they missing something when fantasy play is populated with characters from Hollywood's imagination and not their own? Most of these issues are too vast to



be addressed by a single field of study (let alone a magazine article). But the growing science of play does have much to add to the conversation. Armed with research grounded in evolutionary biology and experimental neuroscience, some scientists have shown themselves eager—at times perhaps a little too eager—to promote a scientific argument for play. They have spent the past few decades learning how and why play evolved in animals, generating insights that can inform our understanding of its evolution in humans too. They are studying, from an evolutionary perspective, to what extent play is a luxury that can be dispensed with when there are too many other competing claims on the growing brain, and to what extent it is central to how that brain grows in the first place.

Scientists who study play, in animals and humans alike, are developing a consensus view that play is something more than a way for restless kids to work off steam; more than a way for chubby kids to burn off calories; more than a frivolous luxury. Play, in their view, is a central part of neurological growth and development—one important way that children build complex, skilled, responsive, socially adept and cognitively flexible brains.

Their work still leaves some questions unanswered, including questions about play's darker, more ambiguous side: is there really an evolutionary or developmental need for dangerous games, say, or for the meanness and hurt feelings that seem to attend so much child's play? Answering these and other questions could help us understand what might be lost if children play less.

"See how that little boy reaches for a pail?" Stuart Brown asked one morning last fall, standing with me on the fringes of a small playground just north of the Central Park Zoo. "See how he curves his whole body around it?" Brown had flown to New York from his home in California to pitch a book about play to publishers. (He sold the idea to an editor at Penguin.) He agreed to meet me at the zoo while he was in town, to help me observe playfulness in the young members of many animal species, including our own.

Social play has its own vocabulary. Dogs have a particular body posture called the "play bow"—forelegs extended, rump in the air—that they use as both invitation and punctuation. A dog will perform a play bow at the beginning of a bout, and he will crouch back into it if he accidentally nips too hard and wants to assure the other dog: "Don't worry! Still playing!"

Other species have play signals, too. Chimps put on a "play face," an open-mouthed expression that is almost like a face of aggression except that the muscles are relaxed into something like a smile. Baboons bend over and peer between their legs as an invitation to play, beavers roll around, goats gambol in a characteristic "play gait." In fact, most species have from 10 to 100 distinct play signals that they use to solicit play or to reassure one another during play-fighting that it's still all just in fun. In humans, the analogue to the chimp's play face is a child's smile, an open expression that indicates there is no real anger involved even in gestures that can look like a fight.

The day Brown met me in the park was a cold one, and the kids were bundled up like Michelin Men, adding more than the usual heft and waddle to their frolicking. Even beneath the padding, though, Brown could detect some typical gestures that these 2 and 3-year-olds were using instinctively to let one another know they were playing. "Play movement is curvilinear," he said. "If that boy was reaching for something in a nonplay situation, his body would be all straight lines. But using the body language of play, he curves and embraces."

In their play—climbing up a slide, running around, passing buckets back and forth—the kids we watched were engaging in a pattern of behavior that many scientists believe is hard-wired. Their mothers and nannies were watching, too, no doubt having dragged the kids out of comfortable Upper East Side apartments because they thought daily play was important somehow, perhaps the first step in the long march toward Yale. To me all that little-kid motion looked just a bit silly—because play is, in many ways, a silly thing. Indeed, an essential component of play is its frivolity; biologists generally use phrases like "apparently purposeless activity" in their definitions of play. The definition proposed by Gordon Burghardt, an evolutionary psychologist at the University of Tennessee, refines that phrase a little. In his 2005 book, The Genesis of Animal Play, "he wrote that play is an activity of limited immediate function."

Burghardt included several other factors in his definition too. Play is an activity that is different from the nonplay version of that activity (in terms of form, sequence or the stage of life in which it occurs), is something the animal engages in voluntarily and repeatedly and occurs in a setting in which the animal is "adequately fed, healthy and free from stress." That last part of the definition—that play requires that an animal be stress-free and secure—suggests that play is the biological equivalent of a luxury item, the first thing to go when an animal or child is hungry or sick.

This makes evolutionary scientists prick up their ears. How can a behavior be crucial and expendable at the same time? And play is indeed expendable. Studies of vervet monkeys found that playtime decreased to almost zero during periods of drought in East Africa. Squirrel monkeys won't play when their favorite food sources are unavailable. In humans under stress, what happens with play is more complicated. Even under devastating circumstances, the drive to play is unquenchable. As George Eisen wrote in "Children and Play in the Holocaust": "Children's yearning for play naturally burst forth even amidst the horror...An instinctual, an almost atavistic impulse embedded in the human consciousness."

Yet play does diminish when children suffer long-term, chronic deprivation, either one at a time in abusive or neglectful homes, or on a massive scale in times of famine, war or forced relocation. And children can still survive, albeit imperfectly, without it.

For humans and animals alike, truly vigorous, wholehearted, spontaneous play is something of a biological frill. This suggests one possible evolutionary function: that in its playfulness, an animal displays its own abundant health and suitability for breeding. But a skeptic

might see it differently: if a behavior is this easy to dispense with when times are hard, it might suggest that the behavior is less essential than some advocates claim.

If play is an extravagance, why has it persisted? It must have some adaptive function, or at least a benefit that outweighs its cost, or it would have been winnowed out by the forces of natural selection. One answer can be found through ethology, the study of animal behavior, which takes as one of its goals the explication of how and why a behavior evolved. Nonhuman animals can be more easily studied than humans can: the conditions under which they are raised can be manipulated, their brains altered and probed. And if there is an evolutionary explanation for a human behavior, it could reveal itself in the study of the analogous behavior in animals. Because of nature's basic parsimony, many aspects of the brain and behavior have been conserved through evolution, meaning that many of the observations that ethologists make in rats, mice and monkeys could apply to humans too.

When it comes to animal play, scientists basically agree that it's mostly mammals that do it, and they basically agree that it's a mystery why they do it, since there are so many good reasons not to. It all seems incredibly wasteful, and nature does not usually tolerate waste.

Play can be costly in terms of energy expenditure. Juveniles spend an estimated 2 to 15 percent of their daily calorie budget on play, using up calories the young animal could more profitably use for growing. Frisky playing can also be dangerous, making animals conspicuous and inattentive, more vulnerable to predators and more likely to hurt themselves as they romp and cavort. Biologists have observed many play-related calamities, like bighorn lambs being injured on cactus plants as they frolicked. One of the starkest measures of the risk of play was made by Robert Harcourt, a zoologist now at Macquarie University in Sydney, Australia, who spent nine months in 1988 observing seal pups off the coast of Peru. Harcourt witnessed 102 seal pups attacked by southern sea lions; 26 of them were killed. "Of these observed kills," Harcourt reported in the British journal Animal Behaviour, "22 of the pups were playing in the shallow tidal pools immediately before the attack and appeared to be oblivious to the other animals fleeing nearby." In other words, nearly 85 percent of the pups that were killed had been playing.

So play can be risky. And, under stress, it tends to disappear. What then would justify, in evolutionary terms, the prevalence of play?

One popular view is the play-as-preparation hypothesis. In this perspective, play evolved because it is good preparation for adulthood. It is a chance for young animals to learn and rehearse the skills they will need for the rest of their lives, and to do so in a secure environment, where mistakes will have few consequences. Proponents of this hypothesis say play is a way—and, not incidentally, a pleasurable way—of getting into muscle memory the generalized movements of survival: chasing, running, probing, tussling. Through play, these movements can be learned when the stakes

are low and then retrieved in adulthood, when the setting is less safe and the need more urgent.

The play-as-preparation hypothesis seems logical, and each new observation seems to confirm it. Watch wolf pups at play, and it is easy to see how the biting and wrangling could be baby versions of the actions the pups will need later to assert their dominance or to help the pack kill its prey. Watch 2-year-olds playing at a toy workbench with little wooden mallets and blocks, and you can picture them as adults employing those same muscles to wield a full-size hammer.

But one trouble with the hypothesis is that the gestures of play, while similar, are not literally the same as the gestures of real life. In fact, the way an animal plays is often the exact opposite of the way it lives. In play-fighting, if one player starts to edge toward victory, he will suddenly reverse roles and move from the dominant to the submissive posture. Or he will stop fighting as hard, something the ethologists call self-handicapping. This is rarely done in real fighting, when the whole point is winning. The targets of play are different, too. In rats, real fighters try to bite one another on the back and the lower flanks; in play fights, they go for the nape of the neck. The gestures players use to nuzzle the neck are not the same ones they need to rehearse if they are to win a serious fight.

Nor is there much experimental evidence to support a connection between youthful playing and adult expertise. One Scottish study of kittens, for instance, tested the hypothesis that ample object play early in life would lead to better hunting later on. The investigator, a psychologist named T. M. Caro then at the University of St. Andrews, found no difference in hunting skills between one group of 11 cats that had been exposed to toys in their youth and a control group of 8 cats that had not.

Now an alternative view is taking hold, based on a belief that there must be something else going on-play not as a literal rehearsal, but as something less direct and ultimately more important. It focuses on the way that play might contribute to the growth and development of the brain.

John Byers started thinking about the brain and play almost by accident. A zoologist at the University of Idaho, Byers had spent years studying the playful antics of deer, pronghorn antelopes and the wild mountain goats called ibex. He knew that play was risky—he had observed ibex kids falling off steep cliffs as they romped—and at first he thought maybe the animals were taking such risks because the motor training helped them get in physical shape for adulthood. But something about this idea troubled him. Play can be exercise, he reasoned, but it was of too short duration to lead to long-term fitness or build muscle tone.

Byers preferred an alternate theory. In almost every species studied, a graph of playfulness looked like an inverted U, increasing during the juvenile period and then falling off around puberty, after which time most animals don't play much anymore. One winter afternoon in 1993, Byers was roaming the stacks at the University of Idaho library, flipping through books the way you do when you're not quite sure what

you're looking for. One book contained a graph of the growth curve of one important region of the brain, the cerebellum, over the juvenile period in the mouse. The growth curve of the mouse cerebellum was nearly identical to the curve of mouse playfulness.

"It was like a light went on in my head," Byers told me from Washington, D.C., where he is temporarily working at the National Science Foundation. "I wasn't thinking specifically about play, but I sort of had a long-term interest in behavioral development." And there it was: a chart that made it look as if rates of play in mice synchronized almost perfectly with growth rates in one critical region of the brain, the area that coordinates movements originating in other parts of the brain.

Intrigued, Byers enlisted the help of a graduate student, Curt Walker, who looked through the scientific literature on cerebellum development in rats and cats. "Then we compared those rates to what was known about the rates of play in those species," Byers said. "And rats and cats showed the same relationship as mice: a match between when they were playing and when the cerebellum was growing."

The synchrony suggested a few things to Byers: that play might be related to growth of the cerebellum, since they both peak at about the same time; that there is a sensitive period in brain growth, during which time it's important for an animal to get the brain-growth stimulation of play; and that the cerebellum needs the whole-body movements of play to achieve its ultimate configuration.

This opened up new lines of research, as neuroscientists tried to pinpoint just where in the brain play had its most prominent effects—which gets to the heart of the question of what might be lost when children do not get enough play. Most of this work has been done in rats. Sergio Pellis, a neuroscientist at the University of Lethbridge in Alberta, Canada, is one of these investigators. He studies how brain damage in rats affects play behavior, and whether the relationship works in reverse: that is, not only whether brain-damaged rats play abnormally but also whether play-deprived rats develop abnormalities in their brains. Pellis's research indicates that the relationship might indeed work in both directions.

参考译文

《给男孩的危险读物》，这本书成功了——在过去的9个月里一直都是最畅销书之一——像折纸飞机这样的小活动它都有逐步的指示说明，这些指示说明也正是对过去那些渴望玩耍的美好岁月的印证。在斯图尔特·布朗图书馆讲话后提出的问题同样也是一种印证，一位女士询问，在她孩子经常沉迷于网络游戏时，如何能让她的孩子学会信任、为他人着想和一些社会技能。布朗告诉她，虽然电子游戏的确有

它某种玩的价值，但只有当孩子全神贯注地在三维世界中玩耍时，才能真正感受到"人与人之间的微妙差别"。

这是美国人对游戏这一问题所进行的一次更大规模谈话的一部分。父母们处于左右摇摆之中，一方面充满怀旧之情地希望孩子们去玩，另一方面却又害怕孩子们把时间都花在玩游戏上而耽误了对更多实际的东西的追求。有这样一则令人担忧的新闻摘要：在科学和数学上，美国孩子落后于其他国家的孩子，随着孩子们上大学的竞争日益激烈，家长们蜂拥般为他们报钢琴课和考前补习课，而不是让他们自己去即兴发挥；游戏时间和重新塑造之间有了较量。

关于游戏的讨论迫使我们不得不思考我们对童年、性别差异、创造力和成功的基本观点。男孩子和女孩子在玩游戏时有差别吗？孩子们紧盯着电脑屏幕和视频游戏会不会受到伤害呢？当他们所着迷的游戏中的人物大多是来自好莱坞影片而不是他们自己周围人物的时候，他们是不是错过了一些东西呢？大多数这样的问题都太宽泛了，不能通过单个研究领域来解决(更何况是杂志上的一篇文章)。但是，游戏变得越来越具有科学性，为这类谈话增加了很多内容。一些研究是以进化生物学和实验神经系统科学为基础的，有了这些研究的支撑，一些科学家已经表现出了他们的迫切心情——有时或许显得太过于迫切了——迫切地想为游戏提出一个科学论据。他们已经把过去的几十年时间都花在研究"玩游戏"这项活动在动物们身上是如何演变的，以及为什么会这样演变过来，通过这个过程，也让我们能够理解这类活动在人类身上的进化。他们正从进化学的角度来研究这个问题：当太多人竞相要求开发人类大脑的时候，在何种程度上，玩游戏是一种可以被省略掉的奢侈活动，又在何种程度上对大脑的开发具有首当其冲的作用。

在动物和人身上研究游戏的科学家们，逐渐达成一致性意见：游戏不仅仅为不愿休息的孩子们消耗过剩精力；也不仅仅为那些胖乎乎的孩子们消耗掉了卡路里；还不仅仅是一种不知不觉中的奢侈行为。在他们看来，玩游戏是神经系统成长和发展的一个重要部分——是孩子们构筑一个复杂的、有技巧的、反应敏捷的、熟悉社会规则的、认知灵活的大脑的一个重要方式。

他们的研究依然留下了一些悬而未决的问题，包括游戏的更不为人知、更令人捉摸不透的方面：例如，对于那些危险游戏，或者说那些低劣的、伤害感情的，似乎孩子们还如此着迷的游戏，真的有进化和发展的必要吗？回答这些和其他一些问题能够帮助我们理解：如果孩子们玩得少些，他们将会失去什么。

社会游戏有它自己的游戏词汇。狗有一种特殊的身体姿势叫做"鞠躬"——前腿伸开，臀部翘在空中——它们用这种姿势表示热烈欢迎和暂时休息。在一次游戏的开始，狗会鞠躬，如果它偶尔捏咬得很厉害，它会蜷缩回去，向同伴示意："别担心，继续玩！"

其他物种也有一些游戏的符号。黑猩猩表现出一种"玩游戏的表情"，它们张开嘴，像是要攻击，然而其肌肉是放松的，有点像是在微笑。狒狒弯腰，从两腿中间窥视，这是一种邀请你玩耍的姿势，海狸滚来滚去，山羊以一种很有特色的"玩的步态"跳跃。事实上，大多数物种都有10~100种明显的游戏暗示，它们用这些暗示请求玩耍，或者是在玩耍过程中让另一方确信这只是一个娱乐游戏。在人类中，孩子的笑容与黑猩猩玩游戏时的表情相似，这个表情暗示着游戏里没有真正的愤怒，尽管在姿势上看起来像是一场战斗。

然而，当孩子们遭受长期的、漫长的玩耍权利的剥夺，抑或不时地在家里受到打骂或忽视，又或者在出现大面积饥荒、战争或被迫背井离乡时，他们玩游戏的心理有所减弱，而且他们依然能够生活，尽管没有游戏的生活并不那么完美。

如果玩游戏是一项奢侈活动的话，为什么人们还把其存留至今呢？它一定有某种适应能力，或是至少有超越游戏的代价的好处，或者它已经被自然选择的力量挑选出来了。通过动物行为学也就是动物行为研究，我们可以找到答案，动物行为研究把解释动物行为是如何产生的，为何这样产生作为它的目标之一。和人类相比，研究非人类动物要容易得多：我们可以监控饲养它们的环境，也可以改变和探测它们的大脑。如果可以从进化学方面对人类的行为进行解释，那么在研究动物的相似行为时就可以发现这样的解释。因为自然本来就非常简单，大脑和行为的许多方面已经通过进化而保留下来了，这就是说，习性学家对硕鼠、小老鼠、猴子进行的许多观察，得出的结论都可以应用到人类身上。

一个大众认可的观点就是“玩即准备”的假设。这个观点认为，游戏之所以得以进化，原因在于它为进入成年期做好准备。对年幼的动物来说，这是在安全的环境中学习演练在今后生活必需技能的一个很好的机会，在这种环境里，所犯的错误几乎不会产生什么后果。这个假设的支持者说游戏只是一种方式——并且是一种令人心情舒畅的方式，这并不是偶然的——让肌肉保存对全身性的生存技能演练的记忆：追逐、奔跑、探索、搏斗。通过游戏，可以在风险很低的时候学会这些技能，进入成年后，在环境不是那么安全，需求又很迫切的时候，又可以再次运用它。

核心词汇

testament ['testəmənt] *n.* 证据，证明
nuance [njuː'ɑːns] *n.* 细微差别
nostalgia [nɔs'tældʒiə] *n.* 乡愁，向往过去，怀旧之情
resume [ri'zjuːm] *n.* 再继续，重新开始
reckon ['rekən] *vt.* 总计，评估，猜想
luxury ['lʌkʃəri] *n.* 奢侈，豪华
consensus [kən'sensəs] *n.* 一致，合意，共识
chubby ['tʃʌbi] *adj.* 圆胖的
frivolous ['friveləs] *adj.* 不知不觉的
developmental [di,veləp'mentəl] *adj.* 发展上的，进化的
foreleg ['fɔːleg] *n.* 前脚，前腿
crouch ['krautʃ] *vi.* 蹲伏，蜷缩
chimp [tʃimp] *n.* (非洲)黑猩猩
baboon [bə'buːn] *n.* 狒狒
beaver ['biːvə] *n.* 海狸
analogue ['ænəlɔg] *n.* 类似物
deprivation [,depri'veiʃən] *n.* 剥夺
neglectful [ni'glektful] *adj.* 疏忽的，不注意的
extravagance [ik'strævəgəns] *n.* 奢侈，浪费
winnow ['winəu] *vt.* 挑出来，精选

With Training, a Dog's Nose Almost Always Knows

27. 通过训练，狗鼻子差不多无所不知

机经选粹

这一篇文章是关于缉毒犬的。文章讲述了缉毒犬的优秀与否取决于它是否得到良好的训练，并讲述了优秀缉毒犬的特征。有选择和T/F/NG。

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With Training, a Dog's Nose Almost Always Knows

Under the watchful eye of their trainer, two diminutive beagles are working their way past suitcases randomly laced with beef, pork, apples, citrus and mangoes.

For the dogs and their handlers, who are new at this, the exercise occasionally becomes a confusing jumble of commands, sights, smells, sounds and rewards. But once they have mastered the 10-week training course the dogs will don the distinctive green vests of the Agriculture Department's Beagle Brigade.

The dogs are the department's primary defense against foods from abroad that can unloose disease, pests and blights, threatening agriculture and health. Jay H. Weisz, who directs the department's National Detection Dog Training Center here, said about 65 agricultural canine teams were already at work at airports, postal depots and border crossings, and that number was to double by next year.

Nonthreatening to weary airline passengers and highly motivated by food rewards,

beagles and other dogs are in high demand for scent work. Increasingly, they are employed to sniff out explosives, guns, drugs, gold ore, gas pipeline leaks, termites, sea turtle eggs, endangered species, traces of flammable compounds used in arson, brown tree snakes hiding in cargo bound for Hawaii, gypsy moth larvae, estrus in cows and underground water leaks, according to experts in the field.

Dr. Lawrence J. Myers, professor of veterinary medicine at Auburn University and an expert in dogs' remarkable sniffing abilities, is investigating claims by some experts that dogs can even detect melanoma and other cancerous tumors.

Though hounds like beagles are renowned for their sense of smell, as a rule, Dr. Myers said, there is more difference in scenting ability between individual dogs than between breeds of dog. Nearly any dog can be trained to detect specific targets using a system of rewards—food, hard rubber balls and towels are employed by different programs—as long as disease and injury have not impaired its sense of smell and behavioral problems do not hinder its ability to learn, he said.

Trainers look for a physically healthy dog with a strong desire to hunt and retrieve objects and then seek to channel that desire. Many programs prefer traditional police dogs or retrievers and sporting breeds, although mutts and Jack Russell terriers, as well as beagles, are also used.

Despite the growth in number and applications of dogs for detection work, little research has been conducted into their capabilities and olfactory processes. Even less is understood about the complex dance of dog and handler, although that dynamic can have a profound affect on success rates, Dr. Myers said.

The few studies that have been conducted indicate that a well-trained dog and accomplished handler can achieve an accuracy rate of about 95 percent, significantly better than any machine. But, Dr. Myers said, any combination of a bad dog and bad handler can drop that figure to around 60 percent.

For example, dogs can learn to respond to unconscious cues from trainers and end up searching for objects they are not trained to find. They also can stop performing well if not properly stimulated and rewarded for their efforts. Temperature and humidity can affect a dog's ability to smell, as well.

Dr. Gary Settles, professor of mechanical engineering at Penn State, says his research suggests that when a dog inhales, the alar fold, a bulbous obstruction just inside its nostrils, opens to allow air to flow clearly through the upper part of the nose across the mucus-covered scent receptors.

When air is exhaled, the alar fold closes off the top part and directs air down and out through the slits at the side of the dog's nose, Dr. Settles said. The process creates a kind of suction that helps the dog inhale even more odor-laced air while also stirring up particles that might help deliver more scent.

Once inside the nose, chemical vapors—and, perhaps, tiny particles—dissolve in mucus-covered olfactory receptors, which in dogs number around 220 million (roughly

40 times the number found in humans), Dr. Myers said. The chemical interactions are converted to electrical signals that travel along the olfactory nerve to the olfactory bulb and then to nearly all parts of the dog's brain.

Dogs and other animals that rely heavily on the sense of smell can identify odors concentrated in an object or piece of ground as small as a dime, Dr. Settles said, teasing from it all sorts of information.

Scent receptors in insects generally are sensitive to particular pheromones that bring about specific behaviors, said Dr. John Kauer, professor of neuroscience at the Tufts University School of Medicine.

But in dogs and many other animals, individual receptors in the nose can become sensitive to a number of different, unrelated chemicals, Dr. Kauer added. That system creates patterns of odor signals that are then processed in the brain, in ways still not understood, to allow the animal to identify an object and its status and respond accordingly.

Several other biological systems , which are not fully understood, are involved in smell in ways. For example, dogs have an organ above the roof of the mouth, behind the incisors. Over the years, many people have suggested that this so-called vomeronasal organ detects pheromones, but researchers say there is no solid evidence of that.

Dr. Kauer is using knowledge of how dogs smell to build an artificial nose for detecting land mines, but so far his best effort is only a tenth as good as a trained dog, he said.

Dr. Myers has shown that scent emanates from an object in a plume that swirls and eddies in a turbulent flow so that there are patches of dense odor and areas of faint odor. In working, a dog quickly scans back and forth with its nose, scanning those densities, until it comes to what it thinks is the source.

That may not always be the object itself, Dr. Myers said. Rather, because of air flow, the source could be in an upper floor of a building or the opposite side of the room. Skilled handlers confirm that their dogs have detected scents emanating from distant sources.

Yet it is also not uncommon for dogs encountering a room full of drugs or a bag loaded with, say, suspect mangoes to fail to alert their handlers. Although the reasons are unclear, the odor in those cases may be so overpowering and evenly distributed around the room that the detector dogs cannot pinpoint the source, Dr. Myers suggested, so they do nothing.

Also, their noses can become saturated with particular odors and desensitized to them, he said. Then, the dog literally needs time to purge the odor-laden mucus from its nose.

Dr. Myers said recent research suggested that two different dogs trained in the same way could respond to entirely different chemical components of an odor and that the components to which they respond could change over time.

The study has clear implications for a dog's success rate because if it is keying on an already faint chemical, when the amount of the substance decreases, the dog may

miss detecting it, Dr. Myers said.

That finding and others, researchers say, also point to the danger of using pseudo scents, which are training aids developed to replicate the primary chemical composition of a drug or explosive.

Although the Beagle Brigade trains on actual food, other detection dogs rely on those pseudo scents, but because their chemical composition is limited, it is often difficult for dogs to generalize from those artificial compounds to the actual substances, where chemicals interact and play off each other to form a complex bouquet.

Over the years, researchers have trained rats, ferrets and other animals to detect explosives and drugs with success equal to that of dogs. Used to hunt truffles, pigs are well known for their olfactory acuity.

But people have always returned to dogs for detection work, not only because of their ability to discriminate between odors but also because, in their long association with humans, they have been bred for sociability and trainability.

参考译文

在训练官的注视下，2只小型米格鲁犬经过几个随意装着牛肉、猪肉、苹果、柑橘和芒果的行李箱，认真地嗅着。

对米格鲁犬和它们的训练官来说，这种训练都是头一回。有时，训练会变得一团糟，命令、瞄准、气味、喧闹声及奖励声等交织在一起。但一旦这两只狗成功完成为期10周的训练课程，他们将穿上农业部检疫犬组特制的绿色背心。

米格鲁犬是该部门专门用来防护从国外进口食品的，因为一些进口的食品可能携带有疾病、虫害和真菌，而这些会威胁到农业发展和卫生健康。该部门负责人国家检疫犬训练中心的杰伊·H.薇兹说大约已有65组农业犬组已被派遣到机场、邮政货运站和边境通道工作，而且明年这个数字将会翻番。

由于米格鲁犬和其他狗对飞机上疲倦的旅客毫无威胁，而且很容易受到食物奖赏的激励，因此它们一直是嗅觉工作里的抢手货。据此领域的专家声称，逐渐地，它们开始涉足嗅炸药、枪支、毒品、金矿、天然气管道的泄漏、白蚁、海龟蛋、濒危物种、纵火案里所用的微量易燃化合物、藏在运往夏威夷货物里的棕树蛇、舞毒蛾幼虫、处于发情期的母牛以及地下水渗漏方面的工作。

奥本大学兽医学教授劳伦斯·J.迈尔斯博士，同时他还是位研究狗惊人嗅觉能力方面的专家。他现在正在调查由一些专家提出的狗甚至可以侦查出黑素瘤和其他癌变肿瘤的论断。

迈尔斯博士说，虽然猎犬以嗅觉灵敏著称，如米格鲁犬，但通常狗个体之间嗅觉能力的差异大于不同品种之间狗的嗅觉能力的差异。只要疾病和伤害没有损害它

的嗅觉以及行为问题不妨碍其学习能力，那么利用奖励刺激——使用于不同学习计划里的食物，硬橡胶球和毛巾——几乎所有的狗都能够训练来侦测具体目标。

训练官寻找身体健康并且有强烈狩猎和找回猎物愿望的狗，然后寻找方法来引导这种愿望。虽然许多行动计划也用于杂种狗、杰克罗素㹴犬以及米格鲁犬，但它们更青睐于传统的警犬、寻回犬或竞技犬。

尽管狗的数量以及在侦查方面的运用不断增多，但人们却很少研究它们的能力和嗅觉过程。迈尔斯博士说，人们对有关狗和训练官复杂舞蹈的了解就更少了，虽然那种对抗性态势对成功率有巨大影响。

少数已进行的研究表明训练有素的狗和熟练的训练官之间配合的准确率可以达到约95%，远远超过任何一台机器的准确率。但是迈尔斯博士也说，任何一只糟糕的狗和一个糟糕训练官的组合都可以把这一数字减少到60%左右。

例如，狗可以学会对从训练官那发出的无意识信号作出回应，结果寻找到在训练过程没有找过的目标。但如果对它们的努力不给予适当刺激和奖赏，它们可能不会表现好。温度和湿度也同样会影响到狗的嗅觉能力。

塔夫斯大学医学院神经科学教授约翰·考尔博士说，通常昆虫的嗅觉器官对引起特有行为的特定信息素十分敏感。

目前尚不完全了解其他几个涉及嗅觉的生物系统。例如，狗有一个器官位于口腔顶部以上，门齿之后。多年来，很多人一直认为这个所谓的犁鼻器可以检测信息素，但研究人员说还没有可靠的证据。

考尔博士正在利用对狗的嗅觉方式的了解建立一个探测地雷的人工鼻，但是他说到目前为止，他尽最大努力能达到的水平也仅仅是一只训练有素的狗的1/10的水平。

迈尔斯博士表明，从一个物体散发出的气味是一缕以湍流旋转的形式上升的汹涌气流，这样就存在气味浓烈的地方和气味模糊的区域。在寻找目标时，狗用它的鼻子迅速来回嗅，直到扫嗅到那些气味浓烈的区域，它才可以找到确认的气味来源。

迈尔斯博士说，来源可能并不总是物体本身，而是由于空气流动，来源可能是在一个建筑物的上层或者房间的对面。熟练的训练官证实他们的狗已经侦查出从远处来源散发出的气味。

但狗碰到一个满是药品的房间或者比如一个装着可疑芒果的包裹却未能使训练官警觉的情况也并不鲜见。迈尔斯博士表示，虽然原因尚不明确，但有可能是在这些情况下气味过于浓烈，而且弥散在整个房间里，以致检疫犬不能准确确定来源的位置，所以它们什么也不做。

他说，此外，它们的鼻子因过于暴露在特殊气味中而变得不敏感。然后，狗确实需要时间来从它的鼻子里清除满是那种气味的黏液。

迈尔斯博士说，最近的研究显示，两只不同种类但以同样的方式进行训练的狗，能对一种气味的不同化学成分作出反应，而且他们对那些化学成分作出反应会随着时间而改变。

这项研究很清楚地显示了狗的成功率，因为如果狗一直接触气味已经变得微弱的化学品，当物质的数量减少时，狗或许不能检测到它的气味。迈尔斯博士说。



研究人员称，这项调查结果以及其他的成果也指出使用人造气味的危险，这些人造气味是用来复制毒品或爆炸物的主要化学成分的训练辅助物。

虽然检疫犬组用真实的食物训练，其他检疫犬则依赖于这些人造气味，但由于它们的化学成分是有限的，让狗把那些人工化合物应用到实际的物质上往往很困难，因为这些实际的化学品相互作用，相互催化形成了一个复杂的气味。

核心词汇

diminutive [di'minjutiv] *n.* 小的，小型的

randomly ['rændəmli] *adv.* 任意地，随便地

citrus ['sitrəs] *n.* 柑橘属果树

mango ['mæŋgəu] *n.* 芒果

depot ['depəu] *n.* 停车场，车站

sniff [snif] *vt.* 以鼻吸气，嗅

cancerous ['kænsərəs] *adj.* 癌的，生癌的

renowned [ri'naund] *adj.* 有名的，有声誉的

impair [im'pɛə] *vt.* 损害，损伤

retrieve [ri'tri:v] *vt.* 取回，恢复

terrier ['teriə] *n.* 㹴犬，一种活泼的小狗

unconscious [ʌn'kɔnʃəs] *adj.* 失去知觉的，无意识的

humidity [hju:'miditi] *n.* 湿度，湿气

pheromone ['ferəməun] *n.* (生化)信息素

neuroscience [ˌnjuərəu'saiəns] *n.* 神经系统科学

incisor [in'saizə] *n.* 门牙，前齿

vomeronasal ['vəumərə'neizəl] *n.* 犁鼻器

faint [feint] *adj.* 微弱的，模糊的

handler ['hændlə] *n.* 训练师

overpowering [əuvə'pauriŋ] *adj.* 压倒(优势)的，压倒性的

saturate ['sætʃəreit] *vt.* 使渗透，使湿透

desensitize [ˌdi:'sensitaiz] *vt.* 使不敏感

pseudo ['sju:dəu] *adj.* 假的，冒充的

replicate ['replikit] *vt.* 复制

bouquet ['bu(:)kei] *n.* 花香，气味

Why Is Spider Silk so Strong?

28. 为何蜘蛛丝如此结实？

机经选粹

这一篇主要讲述了蜘蛛丝的问题，说现在可以运用生物技术制作并运用这种类似蜘蛛丝的产品。

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Why Is Spider Silk so Strong?

Spider silk is not a single, unique material—different species produce various kinds of silk. Some possess as many as seven distinct kinds of glands, each of which produces a different silk.

Why so many kinds of silk? Each kind plays particular roles. All spiders make so-called dragline silk that functions in part as a lifeline, enabling the creatures to hang from ceilings. And it serves as a constant connection to the web, facilitating quick escapes from danger. Dragline silk also forms the radial spokes of the web; bridgeline silk is the first strand, by which the web hangs from its support; yet another silk forms the great spiral.

The different silks have unique physical properties such as strength, toughness and elasticity, but all are very strong compared to other natural and synthetic materials. Dragline silk combines toughness and strength to an extraordinary degree. A dragline strand is several times stronger than steel, on a weight-for-weight basis, but a spider's dragline is only about one-tenth the diameter of a human hair. The movie *Spider-Man* drastically underestimates the strength of silk. Real dragline silk would not need to be nearly as thick as the strands deployed by our web-swinging hero in the movie.

Dragline silk is a composite material comprised of two different proteins, each containing three types of regions with distinct properties. One of these forms an amorphous (noncrystalline) matrix that is stretchable, giving the silk elasticity. When an insect strikes the web, the stretching

of the matrix enables the web to absorb the kinetic energy of the insect's flight. Embedded in the amorphous portions of both proteins are two kinds of crystalline regions that toughen the silk. Although both kinds of crystalline regions are tightly pleated and resist stretching, one of them is rigid. It is thought that the pleats of the less rigid crystalline regions not only fit into the pleats in the rigid crystals but that they also interact with the amorphous areas in the proteins, thus anchoring the rigid crystals to the matrix. The resulting composite is strong, tough, and yet elastic.

M. Dawn of Brandon, Miss., asked the related question, "Why doesn't a spider get stuck on its own web?"

Over the years, three explanations for this phenomenon have surfaced. The first invokes an oil, secreted by the spider, that serves as an anti-stick agent. The problem with this hypothesis is that such an oil hasn't yet been discovered.

The second scenario is based on the diversity of silks. Many webs include strands made of silks that are much less sticky than the others are. The non-sticky strands appear in the hub of the web, the radial spokes and the threads by which the web hangs from plants or other supports. Some researchers have thus posited that the arachnids use only these strands when navigating their webs. If you watch them in action, however, you will see that although they do seem to prefer the non-sticky strands, the spiders are able to move around freely, touching many of the strands, including the very sticky ones that spiral out from the hub.

The third explanation appears to solve the sticky-strand problem. In short, the legs of at least some spiders feature a disengaging mechanism that enables the arachnid to detach itself instantly from a sticky strand. This mechanism involves a clever anatomical adaptation. Each leg ends in a pair of "walking claws" that grasp vegetation, among other functions, but a third claw collaborates with associated spiny, elastic hairs to detach the leg from a sticky web strand. This third claw grasps the strand, pulls it against the elastic hairs, and pulls them further, cocking the mechanism. When the claw relaxes, the hairs rebound vigorously, throwing the strand away and springing the leg free.

Police, the military, physicians, and other groups are eager to obtain large quantities of dragline silk, which can be woven or compacted to make bulletproof clothing, replacement ligaments, medical sutures, fishing line, ropes for rock climbers, tethers to snag planes landing on aircraft carriers and myriad other products. It is impracticable to harvest sufficient quantities of silk from spiders due to their territorial nature, so biotechnologists have turned to other sources. The Canadian company Nexia has demonstrated that goats and cows can be genetically engineered so as to produce dragline silk in their milk. Using a clone of such goats, Nexia aims to produce a modified dragline silk, which they call BioSteel, to meet the many demands.





蜘蛛丝并不是一种单一、独特的材料——不同种类的蜘蛛会吐出种类繁多的丝。有一些蜘蛛拥有多达7种截然不同的腺体，而每种腺体都会产生一种不同的丝。

为何有如此多种蛛丝呢？每一种丝都有其独特的作用。所有的蜘蛛都会编织所谓的牵引丝，其功能与生命线有部分相似，它能使蜘蛛从屋梁上悬挂下来。蜘蛛编织一张丝丝相扣的网，使其遇到危险时能够迅速逃离。同时，主要由牵引丝织成呈放射状的网状结构；搭桥丝是第一根线，使整个网依靠它的支撑悬挂起来，而另一种丝则用来织成大的螺旋状。

不同的丝具有其独特的物理特性，如强度、韧性和弹性，但是与其他天然以及合成材料相比，它们都有很强的强度。牵引丝的韧性和强度都非常好。就重量上而言，牵引丝的强度是同样重量钢铁强度的好几倍，而一根蜘蛛牵引丝却大约只有人头发直径的1/10。电影《蜘蛛侠》大大低估了蜘蛛丝的强度，真正的牵引丝不需要像电影里的英雄所部署的那么厚。

牵引丝是一种合成材料，它由两种不同的蛋白质组成，每一种蛋白质都包含三种特定区域的鲜明属性。其中一个形成能够随意延伸非晶体的(非晶)矩阵，使丝充满弹性。当昆虫袭击蜘蛛网时，矩阵的延伸性使得蜘蛛网能够黏住飞行着想极力挣脱的昆虫。两种水晶蛋白植入非晶部分，使丝变得坚韧。尽管两种晶区紧紧折叠并抑制伸展，但其中有一种是坚固的。有人认为，不太坚固的晶区不仅融入坚硬的晶体里，而且与蛋白质里的非晶体组织结合，从而稳固了坚硬的晶体形成矩阵。这种合成使它具有强度、韧性，还有弹性。

一位来自布兰登的M.多恩女士提到一个相关问题："为什么蜘蛛不会被自己织的网黏住呢？"

多年来，对这种现象已经出现了3种解释。第一种解释是，蜘蛛自身分泌的油状物可以防止被黏住。问题在于至今仍未发现假设的这种油。

第二种情况是基于丝的多样性。很多蜘蛛网的线都是由比别的丝黏性要差很多的丝织成的。没有黏性的丝处于网的中心，悬挂在蜘蛛网上呈放射状的辐条和细丝则是由植物和其他东西编成的。因此一些研究人员断定，蛛形纲动物只使用这些丝织网。不过，如果你观察蜘蛛的活动，你会发现虽然蜘蛛似乎倾向于非黏性丝，但当其移动时触及很多丝，包括远离中心区域的呈盘旋形的黏性很强的丝时仍能自由移动。

第三个解释似乎能解决这个黏丝问题。简而言之，至少有一些蜘蛛的腿具有分离机制的特性，这使蛛形纲动物将自己立即从黏网中脱离出来。这一机制与一个聪明的生理适应有关。在蜘蛛每条腿的末端都有一对"能行走的爪"，这对爪除了能帮助蜘蛛抓住植物外，还有其他功能；而第三只爪满是带刺且有弹性的毛发，帮助蜘蛛将腿从黏性十足的网线上脱离出来。这第三只爪抓住丝，将丝朝具有弹性的毛发的反方向拉动，然后将它们拉得更远，从而激活这一机制。当爪放松时，这些毛发大力反弹，把线弹开，让腿获得自由。

警察、军人、医生和其他群体都十

分期望能获得大量的牵引丝，因为牵引丝可以编织或者制成防弹衣、置换韧带、医疗缝线、钓丝、攀岩绳索、飞机登陆航空母舰时用的绳索以及无数其他产品。由于蜘蛛本身的特性，我们很难从它们身上获取足够数量的丝。因此，生物技术学家已转向其他资源。加拿大尼克夏公司已经证实，在基因上做巧妙的处理可以将山羊和奶牛的奶制成牵引丝。通过克隆山羊等动物，尼克夏公司旨在生产一种名为"生物钢"的改良牵引丝，以满足众多需求。

核心词汇

spider ['spaidə] *n.* 蜘蛛
gland [glænd] *n.* 腺
dragline ['dræglain] *n.* 拉索，牵引索
lifeline ['laiflain] *n.* 生命线
bridgeline ['bridʒlain] *n.* 搭桥丝
spiral ['spaiərəl] *n.* 螺旋形之物
elasticity [ilæs'tisiti] *n.* 弹性，弹力
toughness ['tʌfnis] *n.* 强硬，韧性
deploy [di'plɔi] *vt.* 部署
matrix ['meitriks] *n.* 矩阵
amorphous [ə'mɔ:fəs] *adj.* 无定形的
crystalline ['kristəlain] *adj.* 水晶(般)的，结晶性的
crystal ['kristl] *n.* 晶体
hypothesis [hai'pɔθisis] *n.* 假设
scenario [si'nɑ:riəu] *n.* 情节，方案
hub [hʌb] *n.* 中心
arachnid [ə'ræknid] *n.* 蛛形纲动物
sticky ['stiki] *adj.* 黏性的，黏的
vegetation [ˌvedʒi'teiʃən] *n.* 植物
collaborate [kə'læbəreit] *vt.* 合作，协作
cock [kɔk] *vt.* 激活
vigorously ['vigərəsli] *adv.* 有力地
ligament ['ligəmənt] *n.* 韧带，纽带
suture ['sju:tʃə] *n.* 缝合用的线
genetically [dʒi'netikəli] *adv.* 遗传(基因)地

Creatures of the Thermal Vents

29. 高温喷口处的生物

机经选粹

这一篇第一段讲海底火山早已经被发现；三、四段讲海底火山喷发的过程、海底火山对海洋的影响以及一座黑色火山的形状等；最后几段讲到火山对海洋的影响，即改变温度和化学成分。还讲到火山口有生命，其中之一是一种tube worms，没嘴、没胃、没有任何消化系统，靠体内的细菌（bacteria）产生的碳水化合物生存。

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Creatures of the Thermal Vents

The three-person submersible Alvin sank through the cold, dark waters of the Pacific Ocean for more than an hour, finally touching down on the sea floor more than 8,000 feet below the surface. It was December 1993, and the scientists inside the sub had come to this stretch of the East Pacific Rise, an underwater mountain range about 500 miles southwest of Acapulco, Mexico, to inspect a recently formed hydrothermal vent—a fissure in the ocean bottom that leaks scalding, acidic water.

Peering out through the sub's tiny windows, the visitors were astonished to see thickets of giant tube worms, some four feet tall. The tail ends of the worms were firmly planted on the ocean floor, while red plumes on the other ends swayed like a field of poppies. Alvin had brought researchers to the same spot less than two years earlier, when they had seen none of these strange creatures. Measurements at the site have since shown that individual tube worms can increase in length at a rate of more than 33 inches per year, making them the fastest-growing marine invertebrates. That means tube worms can colonize a vent more rapidly than scientists once thought.

The giant tube worm is one of the most conspicuous members of a diverse community that forms around hydrothermal vents. Scientists once thought that no living thing could

survive the harsh combination of toxic chemicals, high temperatures, high pressures, and total darkness at these vents. But in 1977, researchers diving in Alvin discovered tube worms and other bizarre organisms thriving at a vent off the Galapagos Islands. Similar communities have since been found at several hundred hot spots around the world. These creatures are like nothing else on Earth.

Vents form where the planet's crustal plates are slowly spreading apart and magma is welling up from below to form mountain ranges known as mid-ocean ridges. As cracks form at these spreading centers, seawater seeps a mile or two down into the hot rock. Enriched with minerals leached from the rock, the water heats and rises to the ocean floor to form a vent.

Vents are usually clustered in fields, underwater versions of Yellowstone's geyser basins. Individual vent openings typically range from less than a half inch to more than six feet in diameter. Such fields are normally found at a depth of more than a mile. Most have been discovered along the crest of the Mid-Oceanic Ridge, a 46,000-mile-long chain of mountains that wraps around Earth like the seams on a baseball. A few vents have also been found at seamounts, underwater volcanoes that are not located at the intersection of crustal plates.

The largest vent field, called TAG (short for Trans-Atlantic Geotraverse), is about the size and shape of a football stadium. Other fields have more whimsical names like Clam Acres, Mussel Bed, Rose Garden, Garden of Eden, Broken Spur, and Lucky Strike. Snow Blower is named for the white, flaky bacteria discharged from its vents. Genesis is a vent that sputtered out but came back to life a few years later. Hydrothermal vents are underwater oases, providing habitat for many creatures that are not found anywhere else in the ocean. More than 300 new species have been identified since the first vent was discovered in 1977.

Besides the giant tube worms, which have so far been found only in the Pacific, there are pencil-size Jericho worms with accordion-like tubes; orange worms covered with tiny bristles; small benthic worms that wriggle through the mud; and finger-length, dark red palm worms that stand upright, topped with wig-like fronds. A special class of small worms, called Alvinellids (named after the sub), live on the walls of mineral deposits that form around vents.

Mussels, shrimp, clams, and crabs are abundant at many vents, but these are not the same species that you find in seafood dishes. The cocktail-size shrimp that dominate vents in the mid-Atlantic, for example, have no eyes. However, at least on species has an extremely sensitive receptor on its head that may be used to detect heat or even dim light coming from vents. Scientists still aren't sure how shrimp and other vent creatures cope with chemical-laden seawater that would kill ordinary shellfish.

Biologists have observed a variety of smaller crustaceans around vents, including

miniature lobsters called galatheids, and amphipods resembling sand fleas. They have also seen snail-like limpets, sea anemones, snakelike fish with bulging eyes, and even octopuses.

While octopuses are at the upper end of the vent's food chain, bacteria are at the bottom. They are the first organisms to colonize newly formed vents, arriving in a snowlike flurry and then settling to form white mats or tendrils attached to the ocean floor. Bacteria have been found living beneath the ocean's floor, and it seems likely that they emerge from below when the conditions are right. Vent bacteria can withstand higher temperatures than any other organism. That makes them attractive to researchers who are developing heat-stable enzymes for genetic engineering, and culturing bacteria designed to break down toxic waste.

Water pouring out of vents can reach temperatures up to about 400˚C; the high pressure keeps the water from boiling. However, the intense heat is limited to a small area. Within less than an inch of the vent opening, the water temperature drops to 2˚C, the ambient temperature of deep seawater. Most of the creatures that congregate around vents live at temperatures just above freezing. Thus chemicals are the key to vent life, not heat.

The most prevalent chemical dissolved in vent water is hydrogen sulfide, which smells like rotten eggs. This chemical is produced when seawater reacts with sulfate in the rocks below the ocean floor. Vent bacteria use hydrogen sulfide as their energy source instead of sunlight. The bacteria in turn sustain larger organisms in the vent community.

The clams, mussels, tube worms, and other creatures at the vent have a symbiotic relationship with bacteria. The giant tube worms, for example, have no digestive system—no mouth or gut. "The worm depends virtually solely on the bacteria for its nutrition," says microbial ecologist Colleen M. Cavanaugh of Harvard University. "Both partners benefit."

The brown, spongy tissue filling the inside of a tube worm is packed with bacteria-about 285 billion bacteria per ounce of tissue. "It's essentially a bacterial culture," says Cavanaugh.

The plumes at the top of the worm's body are red because they are filled with blood, which contains hemoglobin that binds hydrogen sulfide and transports it to the bacteria housed inside the worm. In return the bacteria oxidize the hydrogen sulfide and convert carbon dioxide into carbon compounds that nourish the worm.

Tube worms reproduce by spawning: They release sperm and eggs, which combine in the water to create a new worm. Biologists don't know how the infant worm acquires its own bacteria. Perhaps the egg comes with a starter set.

Scientists also don't know how tube worms and other organisms locate new vents for

colonization. "The vents are small, and they're separated, like island," says Cindy Lee Van Dover, a biologist and Alvin pilot who studies vent life. Most vent organisms have a free-swimming larval stage. But scientists aren't sure whether the larvae float aimlessly or purposely follow clues—such as chemical traces in the water—to find new homes.

Studying the life cycle of vent organisms is difficult. Researchers have visited only a fraction of the ocean's hot spots. They have been able to observe vent life only by shining bright lights on creatures accustomed to inky darkness, and many specimens die quickly when removed from their unique environment. Underwater cameras are helping scientists make less intrusive observations, but diving expeditions are still the most useful way to gather information. The 1993 Alvin expedition to the East Pacific Rise was one in a series of dives to the area. The site was first visited in 1989, and scientists observed vent organisms thriving there. But when Alvin returned in April 1991, its flabbergasted occupants witnessed the birth of a hydrothermal vent. A recent volcanic eruption had spread glassy lava across the ocean floor, and the researchers measured temperatures up to 403C—the hottest ever recorded at a hydrothermal vent. The scientists dubbed the site Tube Worm Barbecue, because the worms they brought back to their ship had charred flesh.

"The most spectacular sight down there was this massive blinding snowstorm of bacteria," says Rich Lutz, a marine ecologist at Rutgers University, who led the expedition. On the ocean floor, the bacteria formed mats several inches thick, but the scientists saw no other living things.

Since the eruption, scientists have been able to watch several stages of colonization at the site. When they returned in March 1992, only a few bacterial mats remained. In their place were colonies of Jericho worms and a variety of small crustaceans. The scientists named the area Phoenix, because new life had arisen from the ashes of the eruption.

The scientists first observed the giant tube worms at Phoenix in December 1993. They also noticed a number of mineral deposits, some towering to heights of more than 30 feet. These structures form where hot vent water meets cold seawater, causing metal sulfides to precipitate out. The precipitating sulfides, which look like smoke, amass to form chimneys called black smokers. Like the vent fields, some smokers have names. Smoke and Mirrors, for example, has shelf-like overhangs that trap hot water rising from below, creating upside-down shimmering pools. The largest known black smoker is Godzilla, a 160-foot-tall structure off the coast of Oregon.

During a December 1993 dive to the Phoenix vent field, Alvin accidentally toppled a 33-foot-tall smoker. When the sub returned for a brief visit three months later, the chimney had already grown back 20 feet. Scientists were surprised by the speedy recovery, which seems to parallel the rapid growth of tube worms and other organisms at the vents. The visits to the Phoenix site "give us a sense of how quickly these vents

are colonized," says Van Dover.

Another expedition is planned for November. By then, the community of organisms now prospering at the vents may already be a ghost town. When the flow of hot, sulfide-rich water slows to a trickle, death also comes quickly.



一艘载三人的潜水艇阿尔文号潜入冰冷黑暗的太平洋海底长达一个多小时后，最终在位于水面8,000多英尺下的海床登陆。那是1993年12月，潜艇里的科学家们深入到东太平洋隆起地带——墨西哥阿卡普尔科西南方向一个500米高的海底山脉——探测一个近期形成的热液喷口，该喷口位于海洋底部，其裂缝处喷射出滚烫的酸性水。

科学家透过潜艇的小窗，惊奇地发现外面密密麻麻地生活着巨大的管虫，有些高达4英尺。这些管虫的尾端深深地根植于海底，另一端红色羽毛像大片摇摆着的罂粟。早在2年前，研究人员曾乘坐阿尔文号潜水艇来到相同的地点，那时他们根本就没有发现有这些奇怪的生物。对该地的测量显示，这些个体管虫以每年超过33寸的速度增长，成为海底增长速度最快的无脊椎动物。这就意味着管虫开拓栖居地的速度远远超乎科学家们的想象。

地球的地壳板块缓慢分开，形成喷口，岩浆从下面喷射出来形成山脉，叫做大洋中脊。随着裂缝不断地在这些扩散中心出现，海水慢慢地渗出1英里或2英里，然后渗入到滚热的岩石里。被岩石过滤掉的矿物质流入到海水里滋养了海水，于是海水变热，热量不断上升至海床形成喷口。

喷口通常成片聚集，就像"黄石国家公园喷泉盆地"的水下版。每个喷口的直径一般介于不到半英寸与超过6英尺之间。而且它们通常会形成至少1英里深。其中大部分的喷口被发现在大洋中脊顶部，大洋中脊是一片围绕着地球长4.6万英里的链条山，如同棒球上的缝合线。在海底山以及没有位于地壳板块交接处的水下火山处也发现了一些喷口。

除了迄今为止只在太平洋地区发现的巨型管栖蠕虫之外，还有铅笔大小、貌似手风琴的耶利哥蠕虫、浑身覆盖微小刚毛的橙色蠕虫、在泥土中蠕动的小型底栖蠕虫，另外还有一指长的暗红色掌状蠕虫——这些暗红色的蠕虫直立地站着，顶部长着头发一样的叶状体。一种以潜水艇来命名的特殊小型蠕虫科Alvinellids（阿尔文）栖居在形成喷口的矿床壁上。

在许多喷口处，贻贝、虾、蛤蜊及蟹都很丰富，但它们与你在餐桌上吃的海鲜佳肴并不是一个物种。例如，在大洋中脊占据主导地位的鸡尾虾没有眼睛。不过，至少此类物种的头部有一个十分敏感的感应器，这个感应器可用来探测热量甚至是来自喷口的微弱的光。至今科学家仍然不能确定这些虾类以及其他喷口生物是如何在充满化学物质的海水里生存的，因为这种海水能够杀死普通贝类生物。

生物学家曾观察了位于喷口出的各种较小的甲壳生物，包括一种名为铠甲虾的微型龙虾和类似于沙蚤的片脚类动物。他们也观察了像蜗牛一样的帽贝、海葵、长着鼓鼓眼睛像蛇一样的鱼，甚至还有章鱼。

章鱼处于喷口食物链的顶层，而细菌则位于最底层。它们是新形成的喷口处的第一批生物。它们如骤雪而至，然后形成白色簇团或卷须状物附着在海床上。在海床下面已发现有细菌生存，似乎只要时机一成熟它们就有可能从下面浮上来。喷口处的细菌比其他任何生物体都能承受更高的温度，这对于那些正在研发基因工程热稳定酶和培养可以分解有毒废物的细菌的研究人员来说十分具有吸引力。

喷口喷射出来的水温可以高达400℃，但是高压并没有使海水沸腾。然而，强热只局限在一小部分地区。在离喷口处不到1英寸的地方，水温骤降到深海常温2℃。而大部分聚集在喷口周围的生物其适合生存的温度刚刚超过冰点。因此，化学物质才是喷口生物生存的关键，而不是热量。

喷口水中最普遍的化学物质是硫化氢，闻起来像臭鸡蛋。这种化学物质是由海水与海底岩石的硫酸盐发生反应时产生的。喷口细菌是利用硫化氢而不是阳光作为其能源来源。在喷口处，该种细菌又反过来维持火山口生物群落中较大的有机生物的生存。

在喷口处，蛤蜊、贻贝、管虫和其他动物均与细菌构成一种共生关系。例如巨型管虫，它们没有消化系统——嘴或内脏。哈佛大学微生物生态学家科林·M.凯文诺谈道：“蠕虫几乎完全依赖细菌获取营养，双方互利共生。”

科学家还不知道管虫和其他生物体是如何找到新的喷口作为自己的栖居地的。研究喷口生命的生物学家兼阿尔文号的领船员辛迪·李·凡·多佛尔说：“喷口很小，而且它们还像岛屿一样是孤立的。”大多数喷口有机生物都有一个自由浮动的幼虫阶段。但科学家们不能肯定这些幼虫是漫无目的还是有意地沿着诸如化学物质的痕迹等在水中寻找新的家园。

自从火山爆发以来，科学家已经见证了该栖居地的几个阶段。1992年3月，当他们重返此地时，只有少数细菌依然存在。现在这些地方已经成为耶利哥蠕虫以及各种小型甲壳类动物的栖居地。科学家将此区域命名为凤凰，因为新生命是从火山爆发的废墟中诞生的。

核心词汇

submersible [səb'mə:səbl] *adj.* 能潜水的
scalding ['skɔ:ldiŋ] *adj.* 滚烫的
acidic [ə'sidik] *adj.* 酸性的
worm [wə:m] *n.* 蠕虫
poppy ['pɔpi] *n.* 罂粟
invertebrate [in'və:tibrit] *n.* 无脊椎的动物
magma ['mægmə] *n.* 岩浆
seep [si:p] *vi.* 渗出，漏
mineral ['minərəl] *n.* 矿物，无机物
cluster ['klʌstə] *vt.* 使……聚集，丛生
diameter [dai'æmitə] *n.* 直径
seamount ['si:maunt] *n.* 海底山
intersection [ˌintə(:)'sekʃən] *n.* 交叉点，交集
crustal ['krʌstəl] *adj.* 地壳的
benthic ['benθik] *adj.* 深海底的
dim [dim] *adj.* 暗淡的，模糊的
amphipod ['æmfipɔd] *n.* 片脚类动物
limpet ['limpit] *n.* 帽贝
anemone [ə'neməni] *n.* 海葵银莲花属植物
bacteria [bæk'tiəriə] *n.* 细菌
toxic ['tɔksik] *adj.* 有毒的
microbial [mai'krəubiəl] *adj.* 微生物的
larva ['lɑ:və] *n.* 幼虫
eruption [i'rʌpʃən] *n.* 爆发

Radio ID Tags Part of the Future Despite Glitches

30. 尽管有缺陷，未来仍属于射频识别技术

机经选粹

这一篇是讲RFID，它比条形码先进，文章介绍了其应用、技术原理，以及发展前景。当前的应用是作为钥匙，可以用在自己的车上，还有机场等方面的应用。

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Radio ID Tags Part of the Future Despite Glitches

A year ago, radio frequency identification (RFID) topped every pundit's list of important business technologies to watch in 2005. A year later, businesses are still watching and waiting. .

But while the rise of RFID in 2005 hasn't happened as fast as many experts expected, businesses should continue to pay attention.

RFID promises to revolutionize the world's supply chain, replacing the ubiquitous bar code on product packaging today. It will change the way suppliers and customers interact, allowing both to, among other things, know at any given moment where shipped goods are located, tracking them through every stage of manufacturing and transport, and even to the point of sale itself.

RFID is a wireless data collection technology that uses electronic tags for storing data. RFID tags are a "smart" replacement for bar codes, providing a means to attach information to any product and retrieve it easily. Unlike bar codes, which must be brought close to the scanner for reading, RFID tags are read when they are within the range of a transmitted radio signal. For the low-cost "passive" RFID tags used in retail products, that's a range of about 4.5 metres or less.

RFID is by no means limited to retail and manufacturing, but these are the areas where it has received the most attention. Its supporters promise revolutionary changes in terms of how retail inventory is managed and sold. For example, besides tracking deliveries, RFID could allow retailers to balance supply more precisely with consumer demand by tracking any item that leaves a retail shelf and triggering orders for new stock. Such an efficient logistical process is important in a retail age in which it's essential to shave costs wherever possible.

"Suppliers and manufacturers need to know where a product is—to be able to place it (in a warehouse) and relocate it for shipping processes—as well as know what you have on hand in your warehouse," said Alwyn Mitchell, vice-president of events for SoftMatch.com, which is hosting a Toronto conference on RFID in October. A great deal of money and resources are being invested by retail companies in managing how much stock to keep and when to ship it, he said.

Retail giant Wal-Mart is the retail poster child for RFID. Only a year ago it mandated that by this year at least 100 of its top suppliers must start using RFID tags.

"Our RFID implementation is right on track," Wal-Mart spokeswoman Christi Gallagher said yesterday. "We currently have 100-plus suppliers shipping tagged cases and pallets to our 104 stores, 36 Sam's Clubs and three distribution centres in Dallas/Fort Worth, Texas. We are also working with our next top 200 suppliers, plus several volunteers, to be tagging during or before January, 2006."

Eventually the plan is that all Wal-Mart locations will be RFID-enabled, and presumably all suppliers, both large and small, will need to comply.

But there's a growing community of RFID doomsayers. The tracking technology is still shaking out some bugs, which is not so surprising given its newness. Some reports suggest RFID retail tags have a read-failure rate as high as 20 percent because of radio interference from surrounding objects and the products themselves.

Mark Hall, editor-at-large for *Computerworld* US, predicted last December that there would be problems with the basic Class 1 RFID tags used in the retailer's pilot project. "The readers that use radio frequency signals to get information from the labels aren't capable of achieving 100-percent success in noisy warehouses

loaded with signal-distorting metal objects. And the relatively weak signals from the Class 1 readers will have loads of trouble figuring out what cases of, say, shampoo or dish soap contain, since those signals don't propagate well through liquid," he noted.

Wal-Mart's Ms. Gallagher has said some suppliers have had difficulty finding tags that fit their products or placing them properly. Still, things are improving. A story that appeared in the U.S.—based RFID Journal earlier this year, for example, reported a 98 percent read-rate success in seven Wal-Mart pilot stores. And a recent Associated Press story said a new lab at the University of Wisconsin-Madison, funded by Wal-Mart and more than 40 other companies, is working on ways to make RFID work better by testing new types of tags and the best ways to place them on products. Other universities, including the University of Florida and the University of Arkansas, also have RFID labs, as do dozens of corporations.

As a result, RFID tags themselves are improving—albeit at a cost. Class 3 and 4 products, at about $25 (U.S.) per tag against about 50 cents for the Class 1 types, are much more reliable. These tags won't be suitable for general consumables until their price falls substantially, but they could make sense for such big-ticket items as cars.

The other problem today is that the high cost of deploying RFID systems, coupled with the slow return on investment, will hinder retail use. Louis Sirico, an editor for RFID Operations, estimates the cost of RFID hardware, software, tags and consulting services needed to set up a system that can tag 1,000 items a day amounts to at least $100,000.

"The time to implement a solution like this also varies by company," he noted in a July 7 article, The Cost of Compliance. "The up-front analysis takes more time than installing the equipment. Over all, the internal and external budget to get started will run you between $500,000 and $750,000."

No doubt retail enthusiasm will be tempered if not eliminated by such a large price tag. But despite these rather formidable hurdles, RFID is in a formative stage and continues a march to greater reliability and affordability. It will get cheaper—and better.

RFID may be moving more slowly than its supporters anticipated, but it's inevitable that it will filter down to the rest of the retail industry.

While that may take time, all businesses—small, medium and large—should keep a close eye on the deployment and use of retail RFID, since they'll all be touched by it in one way or another.



参考译文

一年前，所有专家都将射频识别技术列入2005年必须关注的重要商用技术之首。一年后，一些企业仍在观望。

但是当2005年射频识别技术并没有像很多专家所期待的那样以很快的速度发展时，企业仍应该继续予以关注。

射频识别技术承诺要彻底改变世界的供应链，从而代替现在产品包装上普遍存在的条形码。此外它将改变供应者和消费者之间相互作用的方式，让双方在任何时候都能知道货物抵达何处，跟踪制作和运输的每一个过程，甚至是销售本身。

射频识别是一种利用电子标签存储数据的无线数据集成技术。射频识别标签是条形码的“绝佳”替代者，这使信息能够附加于任何产品内，又很容易读取。不像条形码，它必须接近扫描器才能读取数据，而射频识别标签只需标签位于发射的无线电信号范围内就可以读取。对于零售产品使用的低成本“被动的”射频识别标签来说，其读取范围大约是不少于4.5米。

射频识别技术绝不只限于零售业和制造业，但这些是备受关注的领域。该技术的支持者预言，管理和销售零售商库存将发生革命性的变化。例如，除了跟踪货物运送外，射频识别还可以让零售商通过查看售货架上卖出的货物以及根据消费者的需求预订新的存货之间的关系，从而更精确地平衡供求关系。这样一个有效率的运筹过程在零售时代是很重要的，在这个时代里，各个环节尽可能削减成本是必要的。

SoftMatch网站事务部副总裁阿尔文·米切尔说：“供应商和制造商有必要知道货物所处的位置——这样可以将它们存放(在仓库)，并将其转移以备船运——同时也需要知道仓库里现有什么货物。”这个网站10月份将在多伦多举行一个关于射频识别技术的研讨会。他说，零售公司在库存量和运输时间方面投入了大量的资金和资源。

零售界的巨头沃尔玛是射频识别的忠实拥护者。仅在1年前，它就要求其至少100家最大的供应商必须在这一年内开始使用射频识别标签。

“我们的射频识别技术正在不断完善，”沃尔玛的发言人克里斯汀·贾拉赫尔昨天谈道，“目前，我们有100多个供应商运送贴有射频识别标签的货物到位于得克萨斯州达拉斯/沃尔斯堡的104家商店、36家山姆俱乐部和3家配给中心。我们也正在和接下来的200个顶级供应商以及许多自愿者进行磋商，在2006年1月之前把所有商品都贴上射频识别标签。”

最后，计划在所有的沃尔玛店都运用射频识别技术，估计其所有的供应商不论规模大小都必须遵守。

但认为射频识别技术存在问题的人数不断增多。追踪技术仍一直暴露出一些缺陷，而出现新缺陷不足为奇。一些报道表明，射频识别零售标签数据读取失败率高达20%，因为周围的物体以及产品自身对它有无线电干扰。

去年12月，美国《计算机世界》杂志的自由编辑马克·霍尔预言，零售商在其试点项目中所用的基本的一级射频识别标签将存在问题。他指出：“利用无线频率信号从商标中获取信息的读取器，在声音嘈杂的仓库里，受到金属物体信号的干扰不可能百分百读

取成功。而且一级标签的读取器发出的信号相对较弱，这样将在检测装有洗发水或盒装肥皂箱子时遇到很多问题，因为这些信号在液体中传播得不是很好。”

沃尔玛的贾拉赫尔女士说过，有些供应商很难找到适合他们产品的标签，或是不知道把它们贴向何处才合适。但是，情况正在不断得到改善。例如，今年早些时候，在美国的一份射频识别杂志上有这样一篇报道。报道称，在美国7家沃尔玛试验商店里的正确读取率为98%。美联社最近的一篇报道称，威斯康辛大学麦迪逊分校的一所新实验室正通过测试新型标签和贴在产品上的最佳方式以提高射频识别功能的方法。而该实验室由沃尔玛和其他40多家公司共同资助。另外一些大学，包括佛罗里达大学和阿肯色大学，也和许多公司一样建立了射频识别实验室。

因此，射频识别标签也得到了不断改进——尽管费用很大。一级的每个标签只需50分，与之相比，三级或四级的每个标签要花费大约25美元，但后两者更可靠。如果这些标签的价格不做大幅度下调的话，它们将不适应大众消费，但对于一些昂贵物品，比如汽车还是有意义的。

目前存在的另一个问题是，高成本配置射频识别系统和投资收益慢将阻碍它在零售界的发展。据开发射频识别技术的一个编者路易斯·西里科估计，建立一个一天可以给1,000个产品贴标签的系统所需硬件、软件、商标和咨询服务的费用至少要10万美元。

毫无疑问，零售界的热情如果没有被如此之高成本的标签浇灭的话，至少也有所降低。但尽管存在这些很大的障碍，射频识别技术仍然处于一个逐步形成的阶段，而且其可靠性及其承受力正在不断增强，价格也越来越便宜和合理。

也许射频识别技术的发展比它的支持者所期望的要慢，但它将必然渗透到以后的零销行业。

虽然那还需要一段时间，但所有的企业包括小型、中型和大型，都应该密切关注零售射频识别技术的开发和应用，因为这些企业或多或少都会受其影响。

核心词汇

frequency ['fri:kwənsi] *n.* 频率，发生次数
identification [aidentifi'keiʃən] *n.* 识别，鉴定
revolutionize [ˌrevə'l(j)u:ʃənaiz] *vt.* 彻底改革
ubiquitous [ju:'bikwitəs] *adj.* 到处存在的，普遍存在的
track [træk] *vt.* 跟踪，追踪
electronic [ilek'trɔnik] *adj.* 电子的
retail ['ri:teil] *n.* 零售
shave [ʃeiv] *vt.* 削减
warehouse ['wεəhaus] *n.* 仓库
mandate ['mændeit] *vt.* 要求
implementation [ˌimplimen'teiʃən] *n.* 工具
volunteer [vɔlən'tiə(r)] *n.* 志愿者
presumably [pri'zju:məbəli] *adv.* 大概，推测上
comply [kəm'plai] *vi.* 遵守，服从
predict [pri'dikt] *vt.* 预言，预料
load [ləud] *vt.* 装载
consumable [kən'sju:məbl] *adj.* 可消费的
hinder ['hində] *vt.* 阻碍，妨碍
affordability [ə'fɔ:dəbiliti] *n.* 支付能力
anticipate [æn'tisipeit] *vt.* 预期，期望
inevitable [in'evitəbl] *adj.* 不可避免的，必然的

Biology of Time and Aging: State of Art

31. 生物钟与衰老：艺术的形态

机经选粹

这一篇讲的是对于生命周期的科学研究。主要是说人的寿命，甚至任何种群的寿命都是有一样的模式，到了一定时间就会die。不过用科学的方法可以保持人的青春，以至于到达不朽（immortality），不过这对进化有害；然后又说在一些动物上做试验：如冬眠动物比不冬眠动物寿命长，因为消耗的能量少；然后又提到老鼠。最后得出结论我们应该多锻炼、控制饮食，这样才能长命百岁。

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Biology of Time and Aging: State of Art

Our life span is restricted. Everyone knows this and everyone accepts this as 'biologically' obvious, though for most of us this life seems to be too short. 'nothing lives forever.' However, in this statement we think of artificially produced, technical objects, products which are subjected to natural wear and tear during use. This wear and tear leads to the result that at some time or other the object stops working and becomes unusable ('death' in the biological sense). But are the wear and tear and loss of function of technical objects and the death of living organisms really comparable or even similar?

An organism possesses many mechanisms for repair. It is not in principle necessary that a biological system should age and die. Nevertheless a restricted life span, aging and then death are basic characteristics of life. The reason for this is easy to recognize: in nature the existent organisms are regularly replaced by new types. Because of changes in the genetic material (mutations) these organisms have new characteristics and in the course of their individual lives they are tested for optimal

or even better adaptation to environmental conditions. Immortality would disturb this system—it needs room for new and better life. This is one basic problem of evolution. Thus death is a basic precondition for the frictionless and rapid development towards better adaptation to the dominant environmental conditions. The restriction of life by death is then sensibly not left to chance, such as disease or accident. It is thus evidently an inherent property of the system of the organism from the first moment of its development. Life span and death are thus programmed from the start of life. This is known as the hypothesis of genetically programmed aging, ending in death, and is not particularly controversial among scientists. The theory does not necessarily posit aging in the sense of slow loss of function before death. Many organisms even die at the zenith of their physiological abilities. For example, many sorts of plant die shortly after flowering and many insects, fish and worms and other animals immediately after reproduction. This is a particularly clear demonstration of the programmatic character of death. The rare 'Progeria', a hereditary human disease which leads to premature aging, is a further very clear demonstration of the genetic basis of the aging process.

If life span is a genetically determined biological characteristic it is logically necessary to propose the existence of an internal clock, which in some way measures and controls the aging process and which finally determines death as the last step in a fixed programmer. This last step can of course consist of a long succession of different ontogenetic processes. It is of great interest to investigate the site and the function of the 'clock' for life span and on the question of the unit and the beat in which this clock 'ticks'. Are these ticks for example heart beats, breathing acts, metabolic rates or something else? There are a large number of theories dealing with these questions and on the control and the bases of the aging processes perse.

参考译文

我们的生命周期是有限的。人人都知道这一点，而且从生物的角度来看，都认为这一点是显而易见的，虽然对我们大多数人来说，生命似乎太短暂。“没有什么是永恒的。”然而，在这一陈述中，我们考虑到人为生产的技术性的物体和产品在使用中所遭受的自然磨损。这种磨损将会导致在某一时间，物体就会停止工作或变得不能再使用了(也就是生物学意义上的“死亡”)。但是这种磨损和技术上的功能丧失与有生命的生物体的死亡真的可以相提并论或者甚至是相似吗?

一个生物体会拥有许多修复机制。一个生物系统变老和死亡，这在原则上不是必然的。然而一个有限的生命周期，变老然后死亡就是生命的基本特征。原因不言自明：在本质上，现存的生物体会有规律地被新的类型取代。因为遗传物质(转变)

发生了变化，这些生物体又有了新的特征，在个体的生命进程中，他们在经过环境的测试，最优地甚至是更好地适应环境状况。永恒（的变化）会打破这一体系——它需要给新的更适应环境的生命体创造空间。这是进化的一个基本问题。这样，死亡就是不停地快速发展的一个基本的先决条件，这种发展朝向一个能够更好地适应占主导地位的环境状况。通过死亡的方式限制生命，死亡在意外面前毫无疑问是敏感脆弱的，比如说疾病和意外事件。因此，从发展的第一时刻开始，这些生物系统的固有属性就很明显。从生命一开始，生命周期和死亡就被列入计划之内。有一个著名的假设，从基因角度来讲循序渐进地变老，最终死亡，这个假设在科学家们中间没有形成明显的异议。这个理论没有把衰老必然地断定为死亡前功能的慢慢丧失。许多生命体甚至在他们生理能力达到顶峰的时候死亡了。比如，许多种类的植物在它们开花之后即刻死亡，许多昆虫、鱼类和虫类；还有其他一些动物在它们生殖之后就立刻死亡了。这是对死亡的计划性特点的一个非常清楚的例证。稀少的“早衰症”是一种会导致过早衰老的遗传性的人类疾病，是对衰老过程中的基因基础更为清楚的例证。

如果生命周期是一种由基因决定的生物特点，那么对内部生物钟的存在的提议在逻辑上是有必要的，这个生物钟以某种方式测量和控制着衰老过程，并最终能够以固定的程序把死亡定为最后一步。当然，最后这一步可以包括一长串的不同的个体发育过程。为生命周期调查这个“生物钟”的位置和功能，以及调查这个生物钟‘滴答作响’的单位和滴答声是很有趣的。比如说，这些滴答声是心跳、呼吸、新陈代谢率还是其他东西？有大量的理论可以解决这些问题，也有一些理论是关于衰老过程本身的控制和基础的。

核心词汇

subjected [səb'dʒektid] *adj.* 服从的，易患的

unusable [ʌn'ju:zəbl] *adj.* 无法使用的，不能用的

organism ['ɔ:gənizəm] *n.* 生物体，有机体

mutation [mju(:)'teiʃən] *n.* 变化，转变

optimal ['ɔptiməl] *adj.* 最佳的，最理想的

precondition ['pri:kən'diʃən] *n.* 先决条件

frictionless ['frikʃənlis] *adj.* 无摩擦的(光滑的)

sensibly ['sensəbli] *adv.* 容易感知地，敏感地

posit ['pɔzit] *vt.* 假定，认为

programmatic [,prəugrə'mætik] *adj.* 节目的，计划性的

hereditary [hi'reditəri] *adj.* 遗传的，继承的

programmer ['prəugræmə] *n.* 程序员，程序规划员

ontogenetic [ɔntəudʒə'netik] *adj.* 个体生长的，个体发育的

per se [pə:'sei] *adv.* 就本身而言，本质上



Evolution

32. 进化

机经选粹

这一篇讲的是进化和发展。

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Evolution

Role of Extinction

In the last several decades, scientists have questioned the role of extinction in evolution. Of the millions of species that have existed on this planet, more than 99 percent are extinct. Historically, biologists regarded extinction as a natural outcome of competition between newly evolved, adaptively superior species and their older, more primitive ancestors. Recently, however, paleontologists have discovered that many different, unrelated species living in large ecosystems tend to become extinct at nearly the same time. The cause is always some sort of climate change or catastrophic event that produces conditions too severe for most organisms to endure. Moreover, new species evolve after the wave of extinction removes many of the species that previously occupied a region for millions of years. Thus extinction does not result from evolution, but actually causes it.

Scientists have identified several instances of mass extinction, when species apparently died out on a huge scale. The greatest of these episodes occurred during the end of the Permian Period, some 245 million years ago. At that time, according to estimates, more than 95 percent of species—nearly all life on the planet—died out. Another extensively studied extinction took place at the boundary of the Cretaceous Period and the Tertiary Period, roughly 65 million years ago, when the dinosaurs disappeared. In all, more than 20 global mass extinctions have been identified. Some scientists theorize that such events may even be cyclical, occurring at regular intervals.

In the view of many scientists, mass extinctions can be explained by changes in climate—episodes of global warming or cooling that destroy sensitive ecosystems, such as tropical or marine habitats. Other theories have centered on abrupt changes in the levels of the world's oceans, for example, or on the



effect of changing salinity on early sea life. Another theory blames catastrophic events for mass extinction. Strong evidence, for example, supports the theory that a meteorite some 10 km (6 mi) in diameter struck the Earth 65 million years ago. The dust cloud from the collision, according to this impact theory, shrouded Earth for months, blocking the sunlight that plants need to survive. Without plants to eat, the dinosaurs and many other species of land animals were wiped out.

Extinction as a cause of evolution rather than the result of it is perhaps best demonstrated in terms of our own ancestors—ancient mammals. During the time of the dinosaurs, mammals constituted only a small percentage of the animals that roamed the planet. The demise of dinosaurs provided an opportunity for mammals to expand their numbers and ultimately to become the dominant land animal. Without the catastrophe that took place 65 million years ago, mammals may have remained in the shadow of the dinosaurs.

Human Impact

Extinction is not exclusively a natural phenomenon. For thousands of years, as the human species has grown in number and technological sophistication, we have demonstrated our power to cause extinction and to upset the world's ecological balance. In North America alone, for example, about 40 species of birds and more than 35 species of mammals have become extinct in the last few hundred years—mostly as a result of human activity. Humans drive plants and animals to extinction by relentlessly hunting or harvesting them, by destroying and replacing their habitat with farms and other forms of development, by introducing foreign species that hunt or compete with local species, and by poisoning them with chemicals and other pollutants.

The rain forests of South America and other tropical regions offer a particularly troubling scenario. Upwards of 50 million acres of rain forest disappear every year as humans raze trees to make room for agriculture and livestock. Given that a single acre of rain forest may contain thousands of irreplaceable species of plant and animal life, the threat to biodiversity is severe. The conservation of wildlife is now an international concern—as evidenced by treaties and agreements enacted at the 1992 Earth Summit in Rio De Janeiro, Brazil. In the United States, federal laws protect endangered species. But the problem of dwindling biodiversity seems certain to worsen as the human population continues to expand, and no one knows for sure how it will affect evolution.

Advances in medical technology may also affect natural selection. The study from the mid-20th century showing that babies of medium birth weights were more likely to survive than their heavier or lighter counterparts would be difficult to reproduce today. Advances in neonatal medical technology have made it possible for small or premature babies to survive in much higher numbers.

Recent genetic analysis shows the human population contains harmful mutations in unprecedented levels. Researchers attribute this to genetic drift acting on small human populations throughout history. They also expect that improved medical technology may exacerbate the problem. Better medicine enables more people to survive to reproductive age, even if they carry mutations that in past generations would



have caused their early death. The genetic repercussions of this are still unknown, but biologists speculate that many minor problems, such as poor eyesight, headaches, and stomach upsets may be attributable to our collection of harmful mutations.

Humans have also developed the potential to affect evolution at the most basic level—the genes. The techniques of genetic engineering have become commonplace. Scientists can extract genes from living things, alter them by combining them with another segment of DNA, and then place this 'recombinant' DNA back inside the organism. Genetic engineering has produced pest-resistant crops as well as larger cows and other livestock. To an increasing extent, genetic engineers fight human disease, such as cancer and heart disease. The investigation of gene therapy, in which scientists substitute functioning copies of a given gene for a defective gene, is an active field of research. The way this tinkering with genetic material will affect evolution remains to be determined.



参考译文

灭绝的角色

在过去的几十年中，科学家们对灭绝在进化中所起的作用提出了质疑。在地球上曾存在过的数百万物种，99%以上的都灭绝了。从历史的角度，生物学家把灭绝看做一种优胜劣汰的自然竞争的结果：新进化、适应性强的高级物种与更老的、原始的物种之间的竞争。然而，古生物学者最近发现，很多不同、相互之间毫无关联的同时生活在一个大的生态系统中的物种几乎同时趋向灭亡。这总是由于某种气候变化或灾难性事件的发生造成的，它导致了生态环境极为恶劣以至大多数生物难以生存。而且，灭绝的浪潮导致那些曾在某一个地区生活了数百万年的许多物种的灭绝，此后，便进化出了新的物种。如此看来，物种灭绝并不是由进化引起的，相反，实际上它引发了物种进化。

在物种明显地大规模灭绝时，科学家们已经确定了其中的几个事件。这些事件中最重大的一次发生在二叠纪末期，大概2.45亿年前。据估计，那时95%以上的物种——几乎是地球上的所有生命——都灭绝了。另一次被广泛研究的灭绝事件发生在白垩纪和第三纪分界点，大约是在6,500万年前恐龙灭绝的时期。总共有20多次全球范围的大规模灭绝事件已被人们得以确认了。一些科学家推论，此类事件甚至可能是周期性的，定期发生。

在许多科学家看来，大型的灭绝事件可以被认为是由气候变化导致——全球变暖或变冷事件破坏了敏感的生态系统，如热带或海洋栖息地。其他的理论主要围绕世界海平面的剧变展开，例如，早期海洋生物受盐度变化的影响。另一种理论则将大规模物种的灭绝归因于大灾难的发生。例如，支持此理论的确凿证据显示——6,500万年前，一块直径约为10千米(6英里)的陨石撞击了地球。根据这个冲撞理论，冲撞产生大量尘粒将地球遮蔽了数月，阻挡了植物生存必需的阳光。没有植物这种食物来源，地球上的恐龙和很多其他的陆地物种因饥饿而失去了生命。

物种灭绝是进化的起因而非结果，灭绝可能是呈现出我们自己的祖先——远古哺乳动物的最好方式。在恐龙时代，哺乳动物只占生存在地球上的所有动物物种中的很小

一部分。恐龙的灭绝为哺乳动物数量的壮大并最终成为地球上的主要动物提供了机会。如果没有6,500万年前发生的这场大灾难，哺乳动物可能仍生活在恐龙的阴影之下。

人类的影响

灭绝并不仅仅是一种自然现象。数千年来，随着人类数量的不断增长，技术的日益精湛，我们同时也展示了自身引发物种灭绝和扰乱世界生态平衡的能力。单拿北美洲来说，在最近几百年里，就有约40种鸟类和35多种的哺乳动物灭绝了——这主要是由人类活动引起的。人类使得动植物灭绝了：他们毫无节制地捕猎或砍伐植物，开垦农场和进行其他形式的发展来破坏或改造动植物的栖息地，引进以当地物种为食或为竞争对象的外来物种，用化学制剂或其他污染毒害动植物。

南美洲的雨林和其他热带地区呈现出尤为令人忧心的景象。因为人们恣意地毁林开荒，开发农场，豢养牲畜，所以每年有超过5,000万英亩的雨林区消失。如果每一英亩的雨林中都生存有数千种无可替代的植物和动物，那么生物多样性受到的威胁就很严峻了。野生动植物的保护成了全世界关注的焦点——1992年在巴西里约热内卢举行的地球峰会上签订的条约和协定就是明证。在美国，濒危的物种会受到联邦法律的保护。但是随着人口持续增长，生物多样性日益减少的问题似乎必定会恶化，而且没人确切地知道它对物种的进化会造成怎样的影响。

医学技术的进步也可能会影响自然淘汰。20世纪中期的研究表明，出生时重量适中的婴儿比那些过重或过轻的婴儿存活的可能性更大，但如今很难出现这种情况。初生儿医疗技术的进步能够更大限度地使更小或早产的婴儿存活下来。

近期的遗传学分析表明，人口数量具有空前的恶性转变。研究者将此归于少数人群中产生的贯穿历史的遗传漂变。他们也预料，医学技术的进步可能会使这个问题加剧。更好的医术使更多人能存活到生育期，即使他们从上一代人遗传来的基因会引起早逝。此问题对遗传的影响仍不得而知，但生物学家推测，很多轻度的问题如弱视、头疼、反胃可能是我们恶性转变的积累造成的。

人类也在最基本的层次——基因上——发挥了影响进化的潜能。遗传工程学技术已经成为普遍的事。科学家们可以从生物体中提取基因，并通过把它们与另一个DNA片段联合起来改变基因，然后，再把得到的“重组”基因重新植入机体中。遗传学工程已经改造出了抗虫害作物和大型奶牛以及其他牲畜。遗传学工程越来越大程度地被用来医治人类疾病，如癌症和心脏病。基因疗法的调查研究——科学家们以特定基因功能的副本替换有缺陷的基因——是研究领域中积极的一方面。这种用遗传物质修补基因的方法是否会影响进化仍有待判定。

核心词汇

paleontologist [ˌpælionˈtɔlədʒist] *n.* 古生物学者
scale [skeil] *n.* 范围
boundary [ˈbaundəri] *n.* 分界线，边界
cretaceous [kriˈteiʃəs] *adj.* 白垩的，白垩纪的
catastrophe [kəˈtæstrəfi] *n.* 大灾难，大祸
relentlessly [riˈlentlisli] *adv.* 无情地，残酷地
pollutant [pəˈlu:tənt] *n.* 污染物质
raze [reiz] *vt.* 消除，毁灭
neonatal [ˌni:əuˈneitəl] *adj.* 新生的，初生的
exacerbate [eksˈæsə(:)beit] *vt.* 加重，使……恶化
repercussion [ˌri:pə(:)ˈkʌʃən] *n.* 弹回，反响
commonplace [ˈkɔmənpleis] *n.* 常事，老生常谈
extract [iksˈtrækt] *vt.* 提取，吸取
therapy [ˈθerəpi] *n.* 疗法，治疗

The Colourful Butterflies: Defensive Strategy of Butterflies

33. 多彩的蝴蝶——蝴蝶的防御策略

机经选粹

这一篇是讲关于蝴蝶的。一个科学家认为蝴蝶身上色彩斑斓是警告标志，告诉别的动物"我有毒，离我远点"。但按道理说同一个地区的蝴蝶图案应当是相同或相接近，但实际上蝴蝶谷的蝴蝶色彩斑斓，那些捕食动物只能分辨出相近的警告颜色。另一个科学家认为蝴蝶的颜色根据canopy的高度变化，也就是按照光照的高度变化，但这个理论很快被推翻了，因为同一个高度有不同的图案的蝴蝶，最后由各科学家做了很多试验，表明蝴蝶大致爱在两个高度飞行，当然这个不绝对，蝴蝶也偶尔在它喜欢的高度飞翔。

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The Colourful Butterflies: Defensive Strategy of Butterflies

Defensive strategies of butterflies against predators include chemicals, mimicry, aposematic coloration, and evasive flight (*Chai, 1990a*). Mimicry is the ability to appear to be or to imitate something other than what you really are. The use of mimicry is prevalent throughout nature and is a prime example of evolution by natural selection. Butterflies use it as a protection mechanism in their larva stage and in the final adult stage, either to trick predators into thinking they are an inedible species or perhaps an entirely different organism all together. Foremost, the intention of mimicry is to draw attention to yourself. This is usually achieved, but not always,

by advertising your presence with bright colours and is known as "aposematism". These bright colours are probably easier for predators to learn and therefore likely reduces the number of casualties necessary before the predator learns the pattern to avoid and providing the mimic with protection.

Aposematic caterpillars and butterflies are essentially warning predators of impending unpalatability or other physical dangers. This is achieved in several different ways. Some caterpillars and butterflies are poisonous; they have ability to ingest the toxins of their host plants as in the classic example of the Monarch and the cardiac glycosides of milkweed. The milkweed leaves on which the monarch larva feeds contain several substances that are toxic to vertebrates. These poisons are absorbed and retained during the larval stage and passed on, through the transitional stage of metamorphosis, to the adult butterfly, so that adults are unpalatable as well. A short time after a bird eats a portion of a monarch butterfly that had fed on poisonous milkweed, it vomits. Following this episode, the bird refuses to eat any other monarch offered to it.

In the final adult stage we can find mimicry. One of the most striking examples is that of the Viceroy intimating the Monarch . This type of mimicry was first described in 1862 by Henry W. Bates, while studying lepodoptera in Brazil. Subsequently the following can be considered a typical example of "Batesian" mimicry. Since Monarchs are distasteful and will cause vomiting if consumed by a predator the lesson of avoiding Monarchs is quickly learned. Viceroys finds protection through resemblance. A very important facet to this approach and the key to its success is that the numbers of the impostor should not be too high in relationship the one being imitated. The reasoning here is that if the ratio was as high as or approaching say, 50/50, it would be possible for the predator to eventually learn the deception through trial and error and soon be able to recognize the perpetrator.

A further point pertaining to the relationship between the Viceroy and the Monarch is that recently some studies have concluded that the Viceroy itself is a distasteful quarry. If this is the case what would be the benefit in mimicking the Monarch? This type of advantage has been describe by Fritz Muller whereby? Certain protected species sometimes seek to enhance their protection by mimicking other protected species as in the case of this model, if indeed the Viceroy is distasteful to predators, which is known as "Mullerian" mimicry. The difference between these two forms of mimicry is that the "Batesian" mimics have no protection of their own and "Mullerian" mimics already have a form of protection.

Other butterflies, of a "Batesian" example, are the Red Spotted Purple and the female Eastern Tiger Swallowtail which mimic the Pipevine Swallowtail, a distasteful butterfly due to the host plants it eats (Dutchman's Pipevine). The Eastern Tiger Swallowtail females are an intriguing example of

mimicry in that they are dimorphic, which means that there are two forms—one yellow like the male and one black form. Only the black form of the female is a mimic. The number of females presenting themselves in this black mimic form is proportional to the numbers of Pipevine Swallowtails in the area. Again there is no advantage in high ratios between the mimic and the protected specie.

Another approach to survival is protective colouration or crypsis. The formula for success with this survival technique is quite the opposite to mimicry. Here, instead of drawing attention to yourself, the implementer's goal is to camouflage their presence. The larvae of species such as Hairstreaks and Skippers choose this more subtle approach of protective colouration by resembling their host plant colour and patterning. With their uncanny colours and markings they are virtually undetectable and are able to feed in relative obscurity.

Visual cues such as the flight behavior of butterflies, too, are often used as a defensive strategy. Slower fliers are not often attacked or eaten by birds whereas faster fliers are often attacked and eaten. In the palatability experiments, birds either consumed the butterflies or they did not, indicating that there was a very clear distribution of butterfly palatability. The best indicator of bird behavioral response to butterflies was body shape and flight pattern. Slow flying butterflies with long, thin bodies are easily caught, but are also released quickly and not usually harmed. Hard to catch butterflies with short, stout bodies may be evasive, but are quickly consumed when captured.

It has been suggested that the predator can learn the palatability of prey in association with visual characteristics such as body shape and coloration. The behavioral flight pattern of butterflies may also contribute to this associative learning. Once a bird has "learned" the flight characteristics, coloration, palatability, and body shape of surrounding butterflies, it does not try to catch prey exhibiting slow flight, brightly colored wings, and long, thin bodies even though these butterflies are easily caught. Young birds can learn palatability categories as quickly as adults can. During other feeding experiments, male birds were better at discriminating between unpalatable and palatable meals than female birds, although both sexes were able to associate color patterns with palatabilities rapidly. Captive jacamars could memorize the color pattern and palatabilities of many different butterflies as well as distinguish between similar Batesian mimics.

The flight patterns of butterflies may have evolved as a result of selective pressure from predators. Unpalatable species may advertise their bad taste by flying slowly. Leisurely flights enhance predator associative learning and decrease the number of accidental encounters between butterfly and predator. The divergence of flight patterns between unpalatable and palatable butterfly species defines different forms of defense mechanisms.

参考译文

蝴蝶对捕食者的防御策略包括释放化学物质、拟态、警戒色和规避飞行。拟态是指使外表类似于或模拟成其他事物的能力。拟态在整个自然界都很普遍，它是通过自然选择进化的最好范例。蝴蝶利用拟态作为幼虫期和最后成虫期的一种保护机制，使捕食者误认为它们是不宜食用的物种或是完全不同的生物。最重要的是，拟态的目的是要引起其他动物对自身的注意。它通常，但并非总是，通过鲜艳的色彩显示它们的存在——这被称为“警戒态”。这些鲜艳的色彩可能更容易被捕食者记住，因此才可能在捕食者学会躲避模式之前减少伤亡的数量，给模仿者提供保护。

拥有警戒色的毛毛虫和蝴蝶，实质上是警告捕食者它们吃起来不可口或者对捕食者的身体存在危险。这可以通过几种不同的方式实现。一些毛毛虫和蝴蝶是有毒的；它们有能力摄取宿主植物的毒素，典型例子有帝王斑蝶和马利筋中含有的强心甙。帝王斑蝶幼虫以马利筋的叶子为食，叶子里包含着几种对脊椎动物有毒的物质。这些毒物在蝴蝶的幼虫期就被吸收和保留，并通过蜕变的过渡期传递给成虫——蝴蝶，这样就导致成虫也不好吃。一只鸟吃了以有毒的马利筋为食的帝王斑蝶的一部分以后很快会出现呕吐症状。这次经历之后，这只鸟就会拒绝吃任何帝王斑蝶。

在蝴蝶最后的成虫期，我们可以找到拟态的现象，其中一个最突出的例子就是副王蛱蝶模仿帝王斑蝶。1862年，在巴西研究鳞翅目蛹的亨利·W.贝茨，首次描述了这种类型的拟态。随后以下的叙述可以看做是“贝茨拟态”的一个典型例子——由于帝王斑蝶不合口味且食用之后还会引发呕吐，捕食者很快就记住了避免食用帝王斑蝶；而副王蛱蝶便利用与帝王斑蝶的形似来得到保护。这种方式的一个非常重要的一点和成功的关键在于，在与被模仿的对象的关系中，冒充者的数量不应过多。原因是，如果两者比率过高或接近，比如说50/50，最终捕食者将有可能通过不断尝试意识到这种欺骗，并很快能够识别出欺骗者。

关于副王蛱蝶和帝王斑蝶的关系还有一点：最近一些研究已经得出结论，副王蛱蝶本身就是一种不可口的猎物。如果是这样，那么模仿帝王斑蝶会有什么好处呢？这种优势又凭什么让弗里茨·缪勒费力描述呢？答案是某些有保护手段的物种有时通过模仿其他有保护手段的物种来加强对自身的保护。如果事实上对猎食者来说，副王蛱蝶本身就不可口，这被称为“缪勒拟态”。这两种拟态形式之间的区别是“贝茨拟态”的拟态者自己本身没有保护手段，而“缪勒拟态”拟态者则已经有了一种自己的保护方式。

其他“贝茨拟态”的蝴蝶，还有例如红星拟斑紫蝶和雌性东方虎斑凤尾蝶——它们模仿马兜铃凤蝶，马兜铃凤蝶是一种不可口的蝴蝶，这是由于它食用的寄主植物(荷兰的马兜铃)的缘故。东方虎斑凤尾蝶是一个耐人寻味的拟态例子，它们具有二态性，这意味着它雌雄两性有很大差别——雄性是黄色，雌性是黑色。只有黑色的雌性会拟态。把自己展现成拟态形式的黑色雌性东方虎斑凤尾蝶的数量与该地区的马兜铃凤蝶数量成正比。同样，拟态物种和具保护手段物种之间的比率太高是没有任何好处的。

另一种生存办法是使用保护色或隐态。这种生存技巧的成功规则与拟态刚好相反。保护色实施者的目标不是让自己醒目，而是要掩饰它们的存在。一些物种的幼虫，如灰蝶科和弄蝶科的幼虫，就选择这种更微妙的保护色方式保护自己——使自己类似寄主植物的颜色和纹路。在超乎寻常的颜色和花纹的保护下，它们几乎不被察觉，被捕食的几率也能相对较小。

视觉信号，如蝴蝶的飞行行为，也往往被作为一种防御战略。飞得较慢的蝴蝶经常不会遭到袭击或被鸟类吃掉，而飞得更快的蝴蝶却常常被攻击和捕食。在可口性实验中，鸟类食用蝴蝶或者不食用它们，这表明了蝴蝶适口性有一个非常明确的分类。鸟类对蝴蝶的行为反应的最好指标就是蝴蝶的身体形态和飞行模式。飞行慢的蝴蝶身体长而单薄，很容易捕获，但也很容易迅速逃脱，通常不会受到伤害。而较难捕获的蝴蝶身体短而胖，难以捉住，但一旦捉住了很快就会被吃掉。

据说，捕食者可以通过猎物身体的形状和色泽等视觉特性来识别它们的适口性。蝴蝶的飞行行为模式可能也有助于此种联想识别。一旦一只鸟“了解”了周围蝴蝶的飞行特点、色泽、适口性和身体形态，它就不会试图捕捉那些表现出飞行缓慢、翅膀颜色明艳、身体长而薄的蝴蝶，即使它们很容易捕获。幼鸟识别适口性分类能和成鸟一样快。在其他喂养实验中，雄鸟比雌鸟更擅于辨别不可口的与可口的食物，虽然它们都能够很快地把颜色模式和适口性迅速联系起来。笼中的食鸪能够记住很多不同蝴蝶的颜色模式和适口性，并且能够区分相似的“贝茨拟态”者。

蝴蝶的飞行模式可能是由于猎食者带来的选择性压力进化而来的。不可口的物种也许用缓慢飞行来告知猎食者它们的味道很差。从容的飞行增强捕食者的联想识别，减少蝴蝶和捕食者偶然相遇的次数。不可口的蝴蝶种类和可口的蝴蝶种类的飞行模式上的差异界定了不同形式的防御机制。

核心词汇

mimicry ['mimikri] *n.* (动物等)拟态伪装
coloration [kʌlə'reiʃən] *n.* 着色
larva ['lɑ:və] *n.* 幼虫
casualty ['kæʒjuəlti] *n.* 伤亡者，伤亡人数
caterpillar ['kætəpilə] *n.* 毛虫
unpalatability [ʌn,pælətə'biliti] *n.* 不适口性
glycoside ['glaikə,said] *n.* 配醣，甙
milkweed ['milkwi:d] *n.* 马利筋
vertebrate ['və:tibrit] *n.* 脊椎动物
metamorphosis [,metə'mɔ:fəsis] *n.* 变质，变形
distasteful [dis'teistful] *adj.* 不愉快的，讨厌的
resemblance [ri'zembləns] *n.* 相像
deception [di'sepʃən] *n.* 欺骗，欺诈
mimic ['mimik] *vt.* 模仿
dimorphic [dai'mɔ:fik] *adj.* 二态的
proportional [prə'pɔ:ʃənl] *adj.* 成比例的，相称的
subtle ['sʌtl] *adj.* 微妙的，敏感的
palatability [,pælətə'biliti] *n.* 适口性，风味
defense [di'fens] *n.* 防卫，防御

Controlling Pests without Poisons

34. 控制害虫，杜绝毒药

机经选粹

这一篇文章讲述的是农药对害虫的影响，可以造成害虫一出生就有免疫力，还说明了生物控制的优点。

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Controlling Pests without Poisons

The United States is planning to import a moth from Greece that munches on the roots of the knapweed.

The plants flourish on rangeland in the Pacific Northwest and are mildly toxic to cows. By controlling the weeds, officials at the US Department of Agriculture hope to keep the ranges open to cattle grazing.

This is just one example of the search for viable alternatives to chemical pesticides. In the 25 years since Rachel Carson wrote *Silent Spring*, agricultural pesticides have mushroomed into an estimated $18 billion-a-year global industry. Farm use accounts for more than three-quarters of all the pesticides consumed in the US.

And pesticides are integral to modern agriculture.

For example, many farmers no longer rotate crops the way their ancestors did. Alternating crops tends to keep many pests under control naturally, since insects that feed on a certain grain starve during the season that crop is not planted. "A lot of alternative pest control strategies are nothing more than good old-fashioned farming methods", says Garth Youngberg, executive director of the Institute for Alternative Agriculture in Greenbelt, Md.

Mr. Youngberg estimates that there are between 30,000 to 40,000 farms in the US that use little or no pesticides.

"But whether biotechnology is beneficial or not will depend on where the priorities are put", Youngberg says.

And these are not just the "back to nature" types. A growing number of mainstream farmers have begun to question the farming techniques they adopted in recent decades.

As the farm economy has crumbled, farmers have sought to cut their use of expensive chemicals. In addition, there is growing recognition among farmers that agricultural pesticides can contaminate ground water and cause health problems.

Some also question the long-term effectiveness of the chemicals. The National Academy of Sciences calculates that 447 insects had developed some sort of resistance to at least one pesticide by 1984. More than a dozen important insects, including the highly destructive Colorado potato beetle, are now resistant to all five major classes of insecticides.

One popular approach to cutting back on pesticides is known as "integrated pest management". Although the concept is defined many ways, it generally means mixing various pest-inhibiting farming techniques with a minimum reliance on chemicals. Dick Thompson, a farmer from Boone, Iowa, stopped using most pesticides on his land 20 years ago. Although he relies on many classical techniques, such as crop rotation, he also integrates relatively new innovations.

For example, Mr. Thompson uses "ridge tillage", in which crops are planted on mounded ridges in the soil. By disturbing only the top during planting, he has less trouble with weeds and erosion. Thompson says he continues to turn a profit on his crops.

Carrying the search for alternatives steps further—such as importing weed-eating mothsis—known as biological pest control. The first such control program was launched in the 1880s, when California's citrus industry was saved from an infestation of scale insects by the importation of vedalia beetles from Australia.

"There's a long list of problems that could be solved through bio-control, but they aren't", says Roy Van Driesche, an entomologist at the University of Massachusetts. In many cases, he says, "the search for biological solutions is used only when all else fails."

The Department of Agriculture has about 220 scientists working on aspects of biological control through its Agricultural Research Service. But they are sprinkled across a number of programs and offices. An effort is now under way to establish a comprehensive program.

Meanwhile, biotechnology is being touted as a potential source of innovations in pest control. For example, new plants might be developed that are naturally resistant to pests.

Some observers worry that chemical companies—which have invested heavily in biotechnology—could use it to expand the market for pesticides. For example, work is

already under way to develop plants that are resistant to chemical herbicides. One of the problems with herbicides is that they often damage the crops along with the seeds. A herbicide-resistant plant would allow farmers to slosh on even more chemicals.

The underlying question, however, is whether alternatives to chemical pesticides will ever command more than a small share of the market. If the ideas are good, why are they not being used more broadly? Part of the reason is money. To be widely used, alternative pest control techniques must be cost effective. But the large chemical companies have traditionally supported much of the agricultural research done at US universities. Government research is also skewed toward chemical solutions.

The biggest stumbling block, however, is popular perceptions and practices.

"People don't change until they have to", says farmer Thompson. In Iowa, for example, the state legislature has begun looking closely at such issues as ground-water contamination and is pressuring for changes in farming practices.

参考译文

美国正计划从希腊引进一种以矢车菊根部为食的蛾类。

该种植物在美国靠近太平洋西北部的牧场里泛滥成灾，它们能使奶牛慢性中毒。美国农业部的官员们希望能通过抑制这些植物的生长来开拓畜牧草场。

这仅仅只是寻求多种化学杀虫剂的有效替代物研究中的一例。自蕾切尔·卡逊写下《寂静的春天》以来的25年间，农用杀虫剂迅速成长为一个全球性的产业，预计每年效益可达180亿美元。农场中杀虫剂的使用量占全美杀虫剂消耗总量的3/4以上。

并且，杀虫剂是现代农业不可分割的一部分。

例如，许多农场主不再像前人的那种方式轮流作业。由于许多靠某种特定作物为食的害虫在种植不同的农作物的季节会饿死，从而交互式的种植农作物可以自然地控制许多虫害。马里兰州的格林贝尔特可交替农业研究中心的执行董事加斯·杨伯格说道："许多能替代杀虫剂控制害虫的方法只不过就是些好的传统耕种方法。"

扬伯格先生预测，美国大约有3万~4万个农场很少或几乎不使用杀虫剂。

他说："生物技术有益与否将会取决于我们优先考虑的是什么。"

并且，这些并不是仅仅"回归自然"而已。越来越多的主流农场主已经开始质疑他们近几十年来所采用的一些耕作技术。

由于农场经济陷入崩溃境地，许多农场主已开始削减昂贵化学药剂的使用开支。而且，他们越来越认识到农用杀虫剂会污染地下水源，引起健康问题。

还有一些农场主质疑化学药剂的长期影响。据国家科学院估计，截止到1984年，已经有447种害虫对至少一种杀虫剂产生了抗药性。十多种的主要害虫，其中包括具有高度破坏性的科罗拉多马铃薯甲虫，现已对5种主要杀虫剂全都产生了抗药性。

一种颇受欢迎的减少使用杀虫剂的方法就是为人们所知的"害虫的综合治理"。尽管对

此方法的定义有好多种，但通常认为它指的是综合使用各种抑制害虫且减少依赖化学药剂的耕作技术的方法。来自于爱荷华州布恩的农场主迪克·汤普森20年前就停止在自己农场土地上使用大量杀虫剂了。尽管他采用的是一些传统的耕种技术，如农作物轮作等，但他也相应的综合使用了新式改良技术。

举例说，汤普森先生使用"垄耕"方法，将农作物种植在起成垄的土壤里。种植时只会在垄的上部分耕作，而减少了除杂草和水土流失的问题。他说他一直从庄稼种植中获利。

进一步探寻新的化学药剂的可替代物——比如引进以杂草为食的蛾类——即用生物技术控制害虫。这种控制项目首创于19世纪80年代，当时加利福尼亚的柑橘通过引进来自澳大利亚的澳州瓢虫而幸免于蚧虫的大规模侵袭。

"还有一长串的问题需要通过生物控制技术可得以解决，但这些问题并没有采用这种技术去解决。"马塞诸塞州大学的昆虫学家罗伊·万·杜里舒说道。他继续说道："在许多情况下，只有在其他方式不奏效时，人们才会去寻求生物技术的解决方式。"

农业部有约220名科学家通过其农业研究服务系统致力于生物控制技术方面的研究。但是，他们却分散在各个项目、不同的实验室。现在，农业部正在大力设立一个综合性的项目。

同时，生物技术被认为是虫害控制革新的潜在资源。例如：天然抗虫性的新型植物可能会被培育出来。

一些调查者担心化工公司——在生物技术上投入重金的公司——会利用生物技术来扩展杀虫剂的市场。例如，对化学除草剂具有抗药性的植株的开发工作已在进行中。除草剂的问题之一就是它们在除草的同时也会对庄稼产生危害。抗除草剂的植株会让农场主们放心地使用更多的化学药剂。

但是，潜在的问题是化学杀虫剂的替代品能否占据超过一小部分的市场份额。如果这种想法是可行的，为什么没有被更广泛地推广开来？其中的部分原因是资金。可替代的害虫控制技术要得到广泛的推广，必须物有所值。但是传统上，大型化工公司已赞助了美国大学里在农业方面的许多研究。政府研究部门也倾向于化学杀虫。

然而，最大的阻碍来自于公众的认识和实践。

农场主汤普森说道："不到万不得已，人们是不会做改变的。"例如，在爱荷华，州立法委员会开始紧密调查一些诸如地下水源污染的事件，并强制农场主们改变一些不合理的耕作行为。

核心词汇

knapweed ['næp,wi:d] *n.* 矢车菊属的一种
cattle ['kætl] *n.* 牛，牲畜
mushroom ['mʌʃrum] *vi.* 迅速生长，迅速增加
ancestor ['ænsestə] *n.* 祖宗，祖先
strategy ['strætidʒi] *n.* 战略，策略
contaminate [kən'tæmineit] *vt.* 污染，弄脏
pesticide ['pestisaid] *n.* 杀虫剂
define [di'fain] *vt.* 定义
reliance [ri'laiəns] *n.* 信赖，信任
innovation [,inəu'veiʃən] *n.* 创新，革新
mound [maund] *vt.* 筑堤，用土堆防卫
biological [baiə'lɔdʒikəl] *adj.* 生物学的
infestation [infes'teiʃən] *n.* 侵扰
entomologist [entəu'mɔlədʒist] *n.* 昆虫学家
biotechnology [,baiəutek'nɔlədʒi] *n.* 生物技术
herbicide ['hə:bisaid] *n.* 除草剂
slosh [slɔʃ] *vt.* 打，泼
stumbling ['stʌmbliŋ] *adj.* 障碍的
legislature ['ledʒis,leitʃə] *n.* 立法机关
contamination [kən,tæmi'neiʃən] *n.* 污染，弄脏

Collection and Maintenance of Ants to Use for Teaching

35. 为教学目的将蚂蚁收集和饲养

机经选粹

这一篇讲怎样收集蚂蚁。第一段说了分类学收集蚂蚁的要求和生态学收集蚂蚁的要求。然后给了四种方法：手收集、诱饵收集、垃圾收集和陷阱收集。

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Collection and Maintenance of Ants to Use for Teaching

Insects are a readily available resource that should be used more in teaching so that the students can observe and manipulate live animals, an always exciting exercise. However, questions immediately arise. How do you collect insects? Then what must you do to maintain them? How difficult is the collection procedure, and how much and what types of equipment are needed? The purpose of this article is to show how simple it is to collect and maintain ants for classroom use. We also suggest several simple exercises using ants, but many books and pamphlets, including those listed in the reference list, cover many teaching exercises that use ants. Therefore, the main purpose of this article is to show you how to collect and maintain ants with the minimum amount of work and expense. The exercises you can do with these ants are limited only by your imagination.

Ants are the undisputed ecological dominants of the terrestrial world in the

amount of biomass, and in energy used for foraging and maintenance. An often quoted statement form the books by Wilson (1971) and by Holldobler and Wilson (1990) states that the biomass of ants in the Amazon Basin is much greater than that of vertebrate animals. Presently there are 8,800 species of ants that have been described, but this number will ultimately be about 20,000.

Ants are so numerous and occur in so many habitats that it is unbelievable that more use has not been made of the many ideas and accomplishments that we can gain from even a brief study of them and their social organization. Ants have a social organization no matter what species is involved because there are no solitary ants. The basic features of all social insects include an overlap of generations (mother/offspring), the adults care for the young, and a reproductive division of labor.

Collection

There are several ways to catch ants. You can catch them with your fingers: if you want to catch a small ant, you have to lick your fingers and pick up the ant by pressing on its back. If you want to catch a large ant, you pick up the ant by pressing on its back and holding it between your index finger and your thumb. Be careful not to squeeze the ant!

When you want to catch a lot of ants it's easier to collect them by using bait. This bait could be honey or a sugar solution. Put the bait on a sheet of paper and wait until many ants have swarmed onto it before you collect them.

It's more difficult to catch wood ants by extracting them from the nest. So there is another way to catch them. These wood ants live under the skin of a decayed branch or tree. If you break off a branch and ants emerge, you can take the branch home in a bottle or bag.

And another option is to dig up a colony. Formica neoclara or F. podzolica colonies can be located by searching creek bottoms from early spring until snowfall. The typical small earth mounds (37~20 cm tall) of colonies are readily visible. However, some colonies are considerably larger. The ants can be collected at any time, but the best time to collect colonies is when they first emerge from diapause in the spring (April—May), and the workers are very active. Use a shovel to excavate a colony and soil into a heavy (6~8 mil) plastic bag. The bag is then tied for transport to the classroom where the bag is emptied into a clear plastic storage box. A lid (screened or otherwise vented) is then placed on the box. In two-three days the ants will have many tunnels established in the soil in the box, and then you can begin to manipulate the ants. If you want to extract the ants from the soil, drip water slowly into the box (the water level should not exceed a rise of 1.5 cm per hour so the ants will have time to move), and the ants will move upward as the water level rises. Eventually most of the ants will be on the soil surface where they can be vacuumed. These ants can then be placed back into a container with several sheets of heavy paper for cover. Add a water source (cotton swab in a small



plastic dish) and food (insects and/or honey). These ants are very easy to see and manipulate. If workers or queens are needed for specific experiments or observations, these are easily collected with a vacuum into a small container.

Maintenance

Nests: Any of a variety of clear, plastic containers can be used as nests for ants. Rectangular boxes, storage jars, round containers with lids, and even old soda bottles can be converted into nest. All must be vented, and all must have easy access to add water and food. It is probably best to use a large container as a container for the main colony; usually a large number of ants. This container can also serve as a reservoir of ants as they are needed for experiments. Smaller containers, with feeding chambers attached, are used for individual experiments.

Plastic containers can easily be connected using plastic tubing (available in hardware stores or pet shops as air or water tubing). Holes are made in the containers with a heated cork borer or a piece of copper tubing. The tubing is then inserted and cemented into place with silicone cement or hot melt glue.

Many ants are unable to cross barriers or "ant goop" made of a 2:1 mixture of petroleum jelly and mineral oil. However, nearly all species of Formica run across these barriers rapidly so the goop is without value. However, the barrier will work well with carpenter ants and some other species. Test the goop before using it extensively.

Observations

1. Follow the ant. Many ants lay chemical trails that other ants follow. A student can be a "foraging worker" making a trail with toilet paper for other students to follow. The "trail" can start at the nest and go to water or to a food source. Then real ants can be observed to determine if they lay chemical trails. The trail can also be mechanically disturbed to see how this section is treated by the ants. How do they re-establish the trail? Observe individual ants touching the tip of their gaster (abdomen) to the soil surface. Individual ants can be marked on the thorax or gaster with paint (Dope model enamel works well) for identification.

2. Biology. Remove sheets of paper placed into the ant container to observe the immature stages. What stages are present (eggs, larvae, pupae, adults). What do the workers do as the brood is uncovered? Ants that tend the brood are called nurses or nurse workers. What do these workers do if you lightly dust the brood with talcum powder? If a worker is dusted, what does it do? How long does it take for the ants to clean themselves? Ant larvae are covered with hairs that interlock many larvae together so they can be carried in groups. This principle is used in velcro fastenings.

3. Foraging. Add various foods to the feeding chamber of a nest to determine how

long the workers take to find the food, what food is preferred, and how they bring it back to the colony. Calculate the speed of a traveling forager. Compare the speed of the initial forager to ants recruited to the food. If possible feed the ants colored food or dye marked food. Then sample ants that have not left the main container to determine if they have any dye inside them. Crush a worker on a white sheet. Ants usually feed each other (trophallaxis) within minutes of finding food.

4. Communication. These ants use formic acid as a trail material and as an alarm pheromone. Place some formic acid (purchased or crush 10 worker ants) on sheet of paper and introduce it into the colony by holding the sheet of paper with forceps. How do the ants respond? Do they have formic acid? Use indicator (pH) paper and let them spray it. Does it change color? How much does each ant contain? Roll a worker between your fingers then smell it. It should be very pungent.

5. Give workers various pieces of food that they cannot readily reduce in size. What is the largest piece they can transport? Do they cooperate to carry the food? What would happen if an ant grew to 200 pounds? Could it lift a building? Why not?



昆虫是一种应该更多用于教学的现成资源，这样一来，学生就可以观察和利用活体动物，这一直是一项令人兴奋的工作。然而，问题马上随之而来。你如何收集昆虫？然后又如何饲养它们呢？收集的过程有多困难，以及需要多少和什么类型的设备？本文的目的在于讲述收集及饲养教学蚂蚁是件多么容易的事情。我们只建议用蚂蚁演示几个简单的练习，但很多书籍和小册子包括参考目录上列举了很多用蚂蚁来演示的教学练习。因此，本文的主要目的是告诉你如何以最少的努力和最低的花费收集和饲养蚂蚁。你能利用蚂蚁做的练习仅限于你的想像。

在地球上所有的生物中，就生物量和用于觅食、生存的能量大小而言，蚂蚁毫无疑问是具有生态优势的物种。1971年威尔逊出版的书以及1990年由荷尔多布勒和威尔逊共同出版完成的书中都广泛引用这样一句话：亚马逊盆地蚂蚁的总量远远多于脊椎动物的数量。目前已记载的蚂蚁种类有8,800种，但这个数目最终将达到2万种左右。

蚂蚁的数量以及栖息地如此之多，致使对很多可以从蚂蚁及其组织结构所进行的一个简短研究得出来的想法和成果都没有得到更多地利用，这简直令人难以置信。无论是哪种蚂蚁，它们均有一个社会组织，因为蚂蚁属于群居动物。所有的社会性昆虫都有一些基本特征，包括世代重叠(母亲/后代)，成年昆虫照顾幼虫，以及再生劳动分工。

有几种方法可以捕捉到蚂蚁。你可以用手指抓住它们：如果你想捉住一只小蚂蚁，你得舔下你的手指，然后按住其背部再捉起来。如果你想捉住一只大蚂蚁，你得按住它们的背部，用你的食指和拇指把它们捉起来。小心，不要抓得太紧！

当你想要捉住很多蚂蚁时，使用诱饵会更容易。这个诱饵可以是蜂蜜或糖汁。把诱饵

放在一张纸上，等到许多蚂蚁蜂拥而至时，你就可以收集了。

要将木蚁从巢穴里赶出来捉住它们就更困难了。因此，还有一种方法可以捉住它们。这些木蚁生活在腐朽的树枝或树木的表皮下。如果将一根树枝折断，里面有蚂蚁爬出来，那你就可以把这根树枝带回家放在一个瓶子或袋子里。

另一种选择是挖一个蚁穴。Formica neoclara或F·podzolica的蚁穴一年四季都可以在潮沟底采集到，直到降雪。典型的小土墩(37~20厘米)般的居住地随处可见。但是有一些蚁穴相当大。你可以在任何时间收集蚂蚁，但收集蚁穴的最佳时机是蚂蚁冬眠后在春天初次露面时(4—5月)，那时的蚂蚁非常活跃。用一把铁铲，挖出蚁穴，把土放进一个很重的(6~8毫升)塑料袋里。随后扎紧袋子送往教室，然后将袋子里的蚂蚁倒入一个干净的塑料储存盒，再将盖子(密封的或者有通风孔的)盖上。两三天内，蚂蚁将会在盒内的土壤里打出许多通道，这时你就可以开始操作蚂蚁了。如果你想从土壤中捉取蚂蚁，你就要缓缓地将水滴入盒子里(水位的上升幅度不应超过每小时1.5厘米，这样蚂蚁将有时间爬出来)，然后蚂蚁会随着水位的升高向上爬。最后，大部分的蚂蚁会爬到土壤表面，在那里它们处于真空状态。这些蚂蚁便可被放回到一个用几张厚纸盖上的容器里。加一些水(在一个小塑料盆里放上棉签)及食物(昆虫和/或蜂蜜)。这些蚂蚁很容易看到并十分容易操纵。如果工蚁或蚁王需要用作特殊实验或观察，用真空吸尘器就能很容易地把它们收集到一个小容器里。

蚁巢：任何一种干净的塑料容器均可作为蚂蚁的巢穴。长方形的盒子、储存罐、有盖的圆形容器，甚至是旧的苏打瓶均可以改装成蚁巢。所有的巢穴都必须有通风口，并且要方便添加水和食物。最好的办法可能就是用一个大的容器作为大群蚂蚁的主要居住地。当这些蚂蚁需要用作实验时，这个容器也可以用作储存地。配有喂养间的较小的容器可以用来做个别实验。

塑料容器可以轻易地用塑料管连接起来(气管或水管在五金商店或宠物店都可以买到)。用一个发热的木塞穿孔器或是铜管在容器上打一些洞，然后插入管子，与有机硅水泥或热熔胶的地方相连。

许多蚂蚁无法跨过障碍或者是跨过用凡士林油和矿物油以2:1的比例混合配置而成的“蚂蚁黏液”。不过，几乎所有种类的石狩红蚁都能快速越过障碍，所以黏液没有任何意义。这些障碍对于木匠蚁和其他一些种类的蚂蚁来说也没有什么问题，但在大量使用黏液前要先进行实验。

核心词汇

insect ['insekt] *n.* 昆虫
manipulate [mə'nipjuleit] *vt.* 操纵，操控
pamphlet ['pæmflit] *n.* 小册子
undisputed ['ʌndis'pju:tid] *adj.* 无可置辩的，无异议的
biomass ['baiəumæs] *n.* 生物量
numerous ['nju:mərəs] *adj.* 为数众多的，很多的
overlap ['əuvə'læp] *n.* 重叠，重合
reproductive ['ri:prə'dʌktiv] *adj.* 再生的，再现的
thumb [θʌm] *n.* 拇指
squeeze [skwi:z] *vt.* 挤，紧握
bait [beit] *n.* 饵，诱饵
swarm [swɔ:m] *vi.* 蜂拥而至，成群地移动
extract [iks'trækt] *vt.* 提取，获取
branch [brɑ:ntʃ] *n.* 树枝
creek [kri:k] *n.* 小溪，小河
plastic ['plæstik] *adj.* 塑料的
vacuum ['vækjuəm] *vt.* 使……处于真空状态
container [kən'teinə] *n.* 容器
silicone ['silikəun] *n.* 硅树脂
glue [glu:] *n.* 胶，黏着剂
petroleum [pə'trəuliəm] *n.* 石油
carpenter ['kɑ:pintə] *n.* 木工，木匠

How Butterfly Farming Is Saving Endangered Kenyan Coastal Forest

36. 蝴蝶农场如何挽救濒危的肯尼亚海岸森林

机经选粹

这一篇讲的是蝴蝶农场的问题。



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题源全文

How Butterfly Farming Is Saving Endangered Kenyan Coastal Forest

Although Kipepeo Farm cannot export a large proportion of the butterflies it produces, the increased numbers of the insect species has opened up opportunities for nature tourism, reports Juma Kwayera. Tourism has always been Kenyan Coast Province's economic mainstay. However, with the sector doing badly in the recent past, the region has embarked on diversification of income-generation. One such activity is butterfly farming activities being carried out by about 7,000 farmers in Malindi, 80km north of Mombasa.

According to the director of the Kipepeo Butterfly Farm, Washington Ayiemba, an insect expert, the export of butterfly pupi has the potential to earn farmers in the area over $200,000 or Ksh15 million if all the 200,000 pupi produced at the farm per

annum find markets in foreign countries.

One butterfly pupi sells for $1 in the European Union and the US. Like bee-keeping and crocodile farming in the region, butterfly farming is an initiative being supported by the Kenya government to promote sustainable utilisation of non-wood resources without undermining biodiversity.

"With proper education, the people who live around the forest appreciate non-consumptive utilisation of the forest's non-wood products," Ayiemba said during the recent launch of domestic tourism promotion campaign by the Kenya Tourist Board at the Coast. "Production of butterfly pupi has slowed the pace of destruction of the forest and allowed the areas that had been cut down to recover from years of felling of trees for timber and fuel-wood."

The farm, started with a Ksh3.74 million ($49,800) grant from the Global Environmental Facility to protect the region's ecology, which was increasingly under threat from wood poachers, generates over Ksh6.75 million ($90,000) per annum for export to the European Union and the US.

Before this, local people used to supply the timber market in the Middle East by felling mangrove trees, prompting the government to ban timber exports. The ban is still in force, although the government told Members of Parliament from the region in June that it was reviewing its position on mangrove harvesting, with a view to licensing resumption of mangrove harvesting. Mangrove wood is popular in the shipmaking industry in the Middle East and Asia.

The initiation of the project in 1993, alongside others such as beekeeping has also helped ease human-wildlife conflict. A survey conducted by the government before the project was started showed that at that time, 80 per cent of farmers who live around the forest were opposed to the protection of the forest on the grounds that it harboured wildlife that destroyed their crops, resulting in food shortages.

The Coast region has a good climate for the production of oranges, mangoes and bananas in addition to coconut and cashewnut. Ayiemba said that the fruit industry in the region had however remained stagnant because of low investment in fruit processing and poor marketing.

Faced with these problems, he said, the local people were resorting to destruction of the forest by felling trees for charcoal to generate income for their families, which average 15 people per household.

At present, the farm, which produces 200,000 pupi per annum, exports about 50,000 or 30 per cent of the butterflies it hatches—mainly to France and Britain. The rest are left to mature before being released into the bush.

Despite the slow growth in exports, the conservation project appears to have lessened the local people's appetite for timber and fuel-wood as it has improved their incomes without upsetting the ecological balance of Arabuko-Sokoke Forest, which has been under threat from loggers.

Ayiemba said that the butterflies from the farm faced serious competition from

the Philippines and the US, whose pupi are bigger.

Only butterflies from the Kakamega forest in western Kenya can match those from the US in terms of size and variety, says Ayiemba. It is estimated that Kakamega has over 700 butterfly species.

However, owing to the distance between Western Kenya and the Coastal farms, butterflies from the Kakamega forest are uneconomical because of the transport costs involved, says the Kipepeo Farm boss.

The ease of accessing the EU from Malindi and Mombasa by sea makes it economical for the farmers to sell the pupi in foreign markets.

At $1 per pupa, he says, the local products are more expensive than pupi from the US and Philippines. The leading buyers of pupi are butterfly exhibitors in Europe who own tropical gardens where the pupi mature. Butterflies are popular with nature enthusiasts for their resplendent colours and delicate wings.

Although Kipepeo Farm cannot export a large quantity of the butterflies it produces, the increased numbers of the insect species in the forest has opened up opportunities for nature tourism. About 30,000 people, who pay between Ksh50 (6 US cents) and Ksh600 ($8) per head entrance fee, visit the farm every year.

Ayiemba says that, with aggressive marketing of the farm at home and abroad, the revenue that accrues from such visits is likely to rise.

The minders of the Arabuko-Sokoke Forest are at present opening up the indigenous forest for nature trails for visitors who relish ecotourism. To the north of the historical site of Gede Ruins, the villagers are establishing sites for bird viewing. The forest is also the source of the reptiles raised on Mamba (Crocodile) Farm. Mamba Farm is also home to many species of snakes caught in the forest.

While Mamba Farm produces crocodile meat for sale in Coast restaurants and export (mainly to South Africa), the poisonous tropical snakes on the farm are used in scientific research, besides being a tourist attraction. The farm is also used to train locals in environmental conservation, especially bird and snake farming.

参考译文

朱马·卡瓦叶拉报道说：虽然基派皮欧农场不能出口它培育的一大部分的蝴蝶，但这种昆虫种类的增加为自然观光提供了更多机会。旅游业一直是肯尼亚海岸区的经济支柱。不过，由于最近几年旅游部门做得很不好，这个地区已经开始着手于寻求收入多样化。其中一项活动是由蒙巴萨以北80公里的马林迪的大约7,000个农民进行的蝴蝶养殖工作。

根据基派皮欧蝴蝶农场的负责人、

昆虫专家华盛顿·阿依恩巴所说，如果农场每年生产的20万只俑都能够找到国外市场的话，出口的蝴蝶蛹有可能使该地区农民的收入超过20万美元或1,500万肯尼亚先令。

在欧盟和美国，一只蝴蝶蛹售价为1美元。正如在该地区的蜜蜂养殖及鳄鱼养殖一样，蝴蝶养殖是率先得到肯尼亚政府支持的行动，在不破坏生物多样性的条件下促进非木材资源的可持续利用。

阿依恩巴在由肯尼亚海岸的肯尼亚旅游局最近推出的国内旅游宣传活动上称："由于接受了适当的教育，生活在森林周围的人们意识到要对森林非木材产品进行非消耗性使用。蝴蝶蛹的养殖已经减缓了森林遭受破坏的步伐，并使该地区从多年来树木的乱砍乱伐——作为建材和燃料的状态中恢复过来。"

这个农场由全球环境基金拨派的374万肯尼亚先令(4.98万美元)创建，目的是保护该地区日益受到木材偷猎者威胁的生态环境，该农场每年从对欧盟和美国的出口中赚取超过675万肯尼亚先令(9万美元)。

在此之前，当地人曾经通过砍伐红树林来满足中东木材市场的需要，这促使政府禁止了木材的出口。这项禁令现在仍然有效，然而在6月份的时候，政府告诉来自该地区的国会议员，说他们在重申关于采伐红树林的问题，考虑许可恢复红树林的采伐。红树林木材在中东和亚洲的造船业中是颇受欢迎的。

该项目于1993年启动，伴有其他的一些项目，如养蜂等，它有助于缓解人与野生动植物之间的冲突。在该项目启动之前由政府进行的一项调查显示，当时生活在森林周围80%的农民反对保护森林，因为此处栖息着一些野生动物，而这些动物毁坏庄稼造成食物短缺。

海岸地区气候适宜，除了适合生长椰子和腰果，还适合生产橘子、芒果和香蕉。阿依恩巴说，尽管如此，这个地区的水果业却仍然不景气，这是由于在水果加工方面投资很少而且缺乏营销技术。

他说，面对这些问题，当地人民采取破坏森林的方式，砍伐树木获取木炭，为他们平均每户有15个人的家庭提供收入。

目前，农场每年生产20万只蛹，出口约5万只或30%孵出的蝴蝶——主要是向法国和英国出口。其余的则等待它们发育成熟，然后放归灌木丛。

尽管出口增长缓慢，但保护计划似乎已经开始抑制当地人民对采伐树木作为木材和燃料的兴趣，虽然这提高了他们的收入，也毋庸担忧破坏阿拉布口—索科凯森林的生态平衡，但这片森林曾一直遭受伐木者的威胁。

阿依恩巴说，农场的蝴蝶面临着来自菲律宾和美国的严峻竞争，这两个国家的蝴蝶蛹更大。

阿依恩巴指出，只有来自肯尼亚西部卡卡梅加森林的蝴蝶可以在大小和种类上同来自美国的蝴蝶抗衡。据估计，卡卡梅加森林拥有700多种蝴蝶。

然而，基派皮欧农场的老板说，由于肯尼亚西部和海岸农场之间的距离问题，从卡卡梅加森林运输蝴蝶是不实惠的，因为还包含了运输费用。

从马林迪和蒙巴萨海运进入欧盟则很容易，这使农民把蝴蝶蛹销售到在国外市场上变得经济。

基派皮欧农场的老板说："每只蛹售价1美元，这使当地产品比来自美国和菲律宾的还要昂贵。蛹的主要买家是拥有热带果园的欧洲蝴蝶参展商，蛹可以在热带果园成熟。由于蝴蝶鲜艳的色彩和精美的双翼，它们很受自然爱好者的欢迎。"

虽然基派皮欧农场不能出口其养殖的大量蝴蝶，但森林中昆虫种类的增加给自然

旅游创造了机会。每年大约有3万人参观农场，他们每个人支付50肯尼亚先令(6美分)到600肯尼亚先令(8美元)的入场费即可。

阿依恩巴说道，伴随着国内外农场咄咄逼人的营销策略，从这种参观中获得的收入可能会增加。

阿拉布口—索科凯森林的看管者目前正在为津津乐道于生态旅游的游客开放本土森林的自然小道。在歌德废墟历史遗址的北部，村民们正在建立观鸟台。森林也是马姆巴(鳄鱼)农场饲养的爬虫类动物的资源地。马姆巴农场也是众多种类的蛇的故乡，它们在森林里随处可以捕捉到。

马姆巴农场生产的鳄鱼肉用于向海岸餐厅出售和出口(主要是向南非)，而农场里的热带毒蛇除了作为一种旅游景观以外，还用在科研方面。这个农场过去也常常训练当地人去保护环境，尤其是对鸟类和蛇的养殖。

核心词汇

mainstay ['meinstei] *n.* 支柱，主要支持
diversification [daivə:sifi'keiʃən] *n.* 变化，多样化
utilisation [.ju:tilai'zeiʃən] *n.* 利用，使用
consumptive [kən'sʌmptiv] *adj.* 消费的，消耗性的
destruction [dis'trʌkʃən] *n.* 破坏，毁灭
ecology [i(:)'kɔlədʒi] *n.* 生态学
poacher ['pəutʃə] *n.* 偷猎者，侵入者
resumption [ri'zʌmpʃən] *n.* 恢复(再取回)，重新开始
coconut ['kəukənʌt] *n.* 椰子
stagnant ['stægnənt] *adj.* 不流动的，不景气的，停滞的
appetite ['æpitait] *n.* 欲望，渴望
resplendent [ris'plendənt] *adj.* 辉煌的，灿烂的
delicate ['delikit] *adj.* 精致的，微妙的
reptile ['reptail] *n.* 爬行动物

The Binding Problem and How Your Brain Makes Sense of the World

37.捆绑问题与大脑对世界的认知

机经选粹

这一篇通过举例说明人们对于非常重要的东西也会视而不见，并指出看到的东西跟眼睛的运动有关。

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The Binding Problem and How Your Brain Makes Sense of the World

I've been interested in how our brain makes sense of the world for a long time, probably about as long as I've been an atheist. I think a lot of the supernatural experiences that people feel they've had are actually the result of perfectly natural phenomena which they've misinterpreted due to a lack of understanding of how their brain works. Everyone's familiar with the various optical illusions which demonstrate how easily our eyes can be fooled, but most never stop to consider that it's not our eyes that are being fooled; rather it's our brains that are being fooled. Our eyes like all our other sensory organs are constantly transmitting a flood of information to our brain which, as it turns out, isn't as good at taking it all in as we'd like to believe.

Yeah, we've all been told that the most amazing computer that has ever existed is the human brain, but that's not really true. Our brains are pretty pathetic at processing all of the data they take in and so they compensate by cheating: taking shortcuts and ignoring a lot of the input. Keep in mind that it's not just our senses that our brain has to worry about, it also

runs all the bodily systems and is getting tons of feedback from internal sources which it has to respond to. Our lungs don't inflate and deflate on their own, they're controlled by a section of the brain. With all the crap it has to do every second of every day it's really no wonder that our brain has to cheat a little when interpreting all the external stimuli. It doesn't help that different parts of the brain handle different parts of the data processing.

For example, scientists have known for a long time that different regions of the brain are involved in the interpretation of color, shape and movement. What they didn't understand is how the brain puts all of that together in a seemingly perfectly synchronized manner that allows us to recognize, say, a red ball rolling across a table for what it is. This is called the "binding problem" as in "how does our brain bind all the different data together to allow us to see a red ball moving?"

Now scientists at the California Institute of Technology researching this issue have come up with a very simple optical illusion that answers the question. Our brain cheats by making assumptions to fill in any gaps in data by drawing on past experience. They did a segment on NPR the other day called Tricks the Brain Plays that includes the optical illusion so you can try it out for yourself. It opens a small browser window that has a field of random red and green dots that are moving up or down the screen. Within 8 inches of the display you'll think all the red dots are moving down and all the green ones are moving up, but if you shift your eyes to the left or the right of the image the direction of the dots will reverse. If you move back from your monitor you'll realize that the truth is there are three columns of dots. The ones on the left and right have the red dots moving up and the green ones down and the middle column is the reverse.

The Illusion Explained: What's happening is an example of a "binding problem" in the brain. Typically, color and movement are thought to be processed by different parts of the brain. But a red ball rolling across a table looks like a red ball rolling across a table because the brain puts the movement and color information together to form a coherent perception.

The brain is trying to do that in this illusion; it's incorrectly binding color and motion so it can tell us that all the red dots are moving in the same direction throughout our "world," in this case the animation display. The illusion breaks down if you stand several feet away from the monitor, and watch the illusion (a long mouse cable or a friend is necessary to do this.)

Even if you know ahead of time what the truth is that doesn't stop your brain from cheating. It's worse than that, though, some scientists have discovered that it's entirely possible for you to completely miss something that happens right in front of you or that things have changed. Professor Daniel Simons of the Visual Cognition Lab at the University of Illinois has done some amazing experiments on



what he calls "change blindness" and "inattentional blindness." There was an interesting article printed earlier this month in *The Daily Telegraph* called Did you see the Gorilla? that talks about these experiments.

In one experiment, people who were walking across a college campus were asked by a stranger for directions. During the resulting chat, two men carrying a wooden door passed between the stranger and the subjects. After the door went by, the subjects were asked if they had noticed anything change.

Half of those tested failed to notice that, as the door passed by, the stranger had been substituted with a man who was of different height, of different build and who sounded different. He was also wearing different clothes.

Despite the fact that the subjects had talked to the stranger for 10~15 seconds before the swap, half of them did not detect that, after the passing of the door, they had ended up speaking to a different person. This phenomenon, called change blindness, highlights how we see much less than we think we do.

Working with Christopher Chabris at Harvard University, Simons came up with another demonstration that has now become a classic, based on a videotape of a handful of people playing basketball. They played the tape to subjects and asked them to count the passes made by one of the teams.

Around half failed to spot a woman dressed in a gorilla suit who walked slowly across the scene for nine seconds, even though this hairy interloper had passed between the players and stopped to face the camera and thump her chest.

However, if people were simply asked to view the tape, they noticed the gorilla easily. The effect is so striking that some of them refused to accept they were looking at the same tape and thought that it was a different version of the video, one edited to include the ape.

If you stop to think about it you can probably come up with some examples of both of these phenomena in your own life. My recent car accident is a perfect example of inattentional blindness as I never saw the oncoming car until just before it hit me as I was busy focusing on a jeep that was making a right turn onto the same road I was trying to turn left onto. I was so focused on the Jeep that I never saw the Sebring until it hit me.

So, yes, I believe that you think you know what you saw when you show up here and try to convince me that Elvis pulled up to you on a street corner and impregnated you with a mere kiss and I'm not in any way impugning your honesty when I question you on it. I just know that our brains experience a lot of things that aren't true as well as misses a lot of things that are true. If more people would keep that in mind, so to speak, there'd probably be less of a market for the tabloids out there.

参考译文

我们都听说过曾存在的最惊人的计算机是人类的大脑，但这其实并不正确。我们的大脑在处理所接收的所有数据时是相当不足的，因此它们通常以欺骗来弥补这种不足：走捷径或是忽视很多输入的信息。要记住，大脑不仅仅要考虑我们的感官，还要运行所有的身体系统，并对来自体内的信息必须作出反应，获得大量反馈。我们的肺不是自行膨胀和收缩的，而是由大脑的一部分来控制。由于我们大脑要每时每秒处理所有的垃圾，因此当它对外界所有的刺激作出相应的反应时，稍有欺骗也就不足为奇了。大脑的不同部分处理不同的数据程序就无济于事了。

例如，很久以前，科学家就已经知道大脑的不同区域涉及对颜色、形状和运动的理解。他们不能理解的是，大脑怎样以一种看似完全同步的方式把所有的信息整合在一起让我们去认知、表述，比如，一个红色的球滚过桌子就是这种情况。这被称为“捆绑问题”，就像“我们的大脑是怎样把所有不同的资料整合在一起让我们去体会一个红色的球正在运动？”

现在，加利福尼亚理工学院里研究这个论题的科学家们提出了一个非常简单的视觉假象来回答这个问题。我们的大脑通过制造假设来欺骗我们，从过去的经历中提取出数据来填补现在的数据缺口。前些日子，他们在美国全国公共电台制作了一个叫做《大脑所要的手段》的片段，它包含了视觉假象，因此你可以自己进行试验。它创建了一个小型浏览窗口，窗口上的一块区域里有红色和绿色的小圆点在屏幕上任意地上下移动。在8英寸的显示区内，你会认为所有的红点都在向下移动，所有绿点都在向上移动，但如果你把视线转换到这些图像的左边或右边，这些圆点的运动方向会反过来。假如你面对屏幕向后移动，你将认识到事实上是存在3列圆点。左边和右边2列里红点向上移动、绿点向下移动，中间的一栏刚好相反。

这种假象的解释：这是大脑里“捆绑问题”的一个例子。一般来讲，颜色和运动被认为由大脑的不同部位来处理。但一个红色的球滚过桌子之所以看起来像一个红色的球滚过桌子是因为大脑把运动和颜色信息整合在一起形成一种一致的感知。

在这种错觉中，大脑尝试着整合信息；它错误地捆绑了颜色和运动，所以它告诉我们，在我们的整个“世界”里，所有的红点都是朝着同一个方向运动，动画就是这样呈现出来的。如果你站在离屏幕几英尺的地方观看(长鼠标线或一个朋友是必备条件)，这种错觉就被打破了。

即使你事先知道事实，也不可能阻止大脑对你的欺骗。但是，更为糟糕的是，一些科学家已经发现完全忽略就发生在你正前方或是已经变化的事是完全有可能的。伊利诺斯大学视觉认知研究室的丹尼尔·西蒙斯博士已经就他所称的“变化盲视”和“无意视盲”做了很多了不起的试验。这个月初，《每日电讯报》上发表了一篇名为《你看见大猩猩了吗？》的有趣文章，谈的就是这些试验。

在一个试验中，人们正穿过一个大学校园，这时一个陌生人过来问路。在他们的谈话过程中，两个人抬着一扇木门从陌生人和这些试验对象中间穿过。当门经过

之后，研究人员问这些人有没有注意到什么东西改变了。

一半被测试的人都没有注意到，当门经过时陌生人已经替换成了另一个身高、体形和声音都不同的人。他穿的衣服也不一样。

虽然在交换前，这些试验对象已经和陌生人交谈了10~15秒，但半数的人都没有察觉，在门经过以后他们已经同一个不同的人结束了对话。这种现象叫做变化盲视，着重反映了我们看到的远远少于我们认为自己所看到的。

在哈佛大学和克里斯托夫·查布瑞斯一起工作时，西蒙斯提出了现在已成为典范的另一个实证，它是基于一盘少数人在打篮球的录像带。他们给试验对象播放这盘录像带，要求他们数出其中一个队过人的次数。

大约一半人没有注意到一个穿着大猩猩服装的女人花了9秒钟慢慢走过赛场，即使这个长毛的闯入者在篮球队员间穿过，甚至还在摄影机前停下来捶击她的胸脯。

然而，如果人们只是被要求观看录像带，他们很容易就注意到了大猩猩。效果是如此惊人，其中一些人甚至拒绝承认他们看的是同一盘录影带，他们认为看的是不同版本，只不过其中一盒剪辑时包含了那只大猩猩罢了。

如果你停下来去思考，你可能会在生活中发现很多包含这两种现象的例子。我最近的一场交通事故就是无意视盲的一个绝佳事例，我一点都没有注意到那辆正开向我的汽车，直到它撞上我，因为我当时正注视着一辆正在向右拐弯的吉普车，它要进入的道路刚好是我要左转进入的道路。我的注意力全集中在这辆吉普车上面，所以直到那辆铂锐撞上我时，我才看见它。

我只知道我们的大脑经历了许多不真实的事，也错过了许多真实的事。如果更多的人记住这一点，可以说小报存在的市场可能会小很多。

核心词汇

pathetic [pə'θetik] *adj.* 悲哀的，差劲的
inflate [in'fleit] *vi.* 膨胀
deflate [di'fleit] *vi.* 缩小
crap [kræp] *n.* 无用的东西，垃圾
interpretation [in,tə:pri'teiʃən] *n.* 解释，理解
synchronized ['siŋkrənaizd] *adj.* 同步的，同时发生的
illusion [i'lu:ʒən] *n.* 幻觉，错觉
random ['rændəm] *adj.* 任意的，随便的
coherent [kəu'hiərənt] *adj.* 连贯的，一致的
amazing [ə'meiziŋ] *adj.* 令人惊异的
swap [swɔp] *n.* 交换，交换的东西
detect [di'tekt] *vt.* 发现，察觉
videotape ['vidiəu'teip] *n.* 录像带
gorilla [gə'rilə] *n.* 大猩猩
interloper [,intə'ləupə] *n.* 闯入者
ape [eip] *n.* 猿
tabloid ['tæblɔid] *n.* 小报，小型画报

Mystery of "Blindsight" Lets Some Blind People "See", Study Shows

38. 研究揭示盲视奥秘，让一些盲人重见光明

机经选粹

这一篇讲的是盲人对意识的图形表达(盲人以符号传递情感)。盲人和正常人对于抽象图形的理解，开始举了个例子，有个盲人用曲线表示轮子的转动，通过实验得出结论：盲人和正常人在对抽象图形的理解方面很相似。

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Mystery of "Blindsight" Lets Some Blind People "See", Study Shows

An innovative research technique is providing insight into why some blind people are able to sense and describe objects they cannot see.

The phenomenon of "blindsight" occurs in some people who suffer injuries to the primary visual cortex, the region of the brain considered essential for sight.

"Blindsight allows people to use visual information they get through their eyes even though they have no consciousness of the visual experience," said Christopher Mole, a postdoctoral fellow in philosophy at Washington University in St. Louis, Missouri.

"But that of course is quite hard to show in the lab," he said.

A team of psychologists at Rice University

in Houston, Texas, may have found a way to directly study blindsight in the lab.

They are using electromagnetic stimulation on the brains of people who can see to render them partially and temporarily blind.

"The way it works is an electric current inducts into the brain via a magnetic pulse, and that causes a disruption of underlying neurons in the brain," said Tony Ro, a member of the Rice team.

"What this technique allows us to do essentially is in a safe and noninvasive way shut down a portion of the brain temporarily," he added.

Ro and colleagues report their technique and findings in the current issue of the journal *Proceedings of the National Academy of Sciences.*

Mole said the Rice team reports "compelling proof" for blindsight.

Unconscious Pathway

Blindsight is most prevalent among people who suffer damage to the primary visual cortex, such as in some stroke victims, Mole explained.

"However this is never "clean" or specific damage—other parts of the brain are also impaired. Studies with these patients are therefore difficult," he said.

To study blindsight directly, researchers often purposefully and permanently disrupt the primary visual cortex in monkeys and other mammals, a method that would be unethical to use on humans, Mole said.

"What (Ro's team) has done is cleverly manage to interfere with the brain in a totally temporary way...It doesn't have any long-term lasting effects at all," he said.

The technique devised by the Rice researchers induced blindness for a fraction of a second in people who ordinarily have good vision.

During the state of temporary blindness, an object was flashed on a screen in front of the test subjects' eyes.

In one experiment the object was either a vertical or horizontal bar, and the subjects were asked to guess the bar's orientation. In the second experiment the researchers flashed a colored disc, and subjects were asked to guess the color.

In both experiments the blinded volunteers correctly guessed the characteristics of the objects at much higher levels than chance alone.

This fits the definition of blindsight and raises the question of how it is possible.

"What we believe is happening is people are able to discriminate orientation and color—as our experiments showed—by processing routes into the brain that aren't consciously accessible," Ro said.

"We believe there are pathways that go from the eyes into the brain that bypass the normal routes tied to conscious processing of information."

Ro added that the study supports the theory that these pathways go to a visual center in the brain that is more sophisticated than the visual centers common to all mammals.

This suggests the pathways may be unique to higher-order species.

The test results also show that volunteers were more accurate when they were more confident in their guesses.

"It's unclear what that reflects, but what we think it reflects is that this unconscious processing system can contribute to feelings of certainty," Ro said.

In follow-up experiments the team will test why people feel varying levels of confidence in their guesses. "Perhaps the unconscious processing routes are stronger in some people than others," Ro said.

参考译文

一项创新的研究技术正在深入探讨为何一些盲人能够感知和描述他们看不见的物体。

主要视觉皮质区是大脑中最重要的视觉区域。如果某人的主要视觉皮质区受损，那么就会出现"盲视"的现象。

密苏里州圣路易斯市华盛顿大学的一位名为克里斯托弗·摩尔的哲学博士后谈道："盲视使人们可以利用通过眼睛获取的视觉信息，即便他们毫无视觉体验。"

他还说道："然而，毫无疑问，在实验室里演示这一过程十分困难。"

在得克萨斯州休斯顿赖斯大学，一个心理学家组成的研究小组或许已经找到了一种直接在实验室里研究盲视的途径。

他们对视觉正常的人群的大脑进行电磁刺激，让他们的眼睛出现部分盲视或是短暂性失明。

赖斯大学研究小组的一名研究人员托尼·罗说道："这种方法的作用方式是通过磁脉场将电流输入大脑，导致大脑内基础神经元短路。"

他还补充道："实质上，这项导致部分大脑暂时性短路的技术，是一种非侵害性的安全途径。"

罗和他的同事们在《国家自然科学院学报》的近期期刊上发表了他们的研究技术和成果。

摩尔谈道，赖斯大学研究小组为盲视提供了"令人信服的证据"。

非意识性传导通路

摩尔解释说，盲视集中出现在那些主要视觉皮质区受损的人群，如某些中风患者中。

他说："然而，这并不是具体或者明确的损伤，因为大脑其他部位也会受损。因此，对这类病人进行研究显得十分困难。"

摩尔还表示，为了直接研究盲视，研究者们经常有意地且不断地破坏猴子和其他哺乳动物的主要视觉皮质区，而这种研究方法若应用到人类身上则是有悖伦理的。

他谈道："赖斯大学研究小组所做的一切正十分巧妙地试图以一种完全是暂时性的方式来损坏大脑……它不会产生长期持续的影响。"

赖斯大学研究小组的研究者们设计的这项技术促使那些在通常情况下拥有正常视力的人在瞬间失明。

在这种暂时性失明的状态下，一个物体会在被试者眼前的屏幕上快速闪过。

在其中一个试验中，这个物体是一根垂直或者水平放置的棒子，要求被试者猜测棒子放置的方向。在第二个试验中，研究者在被试者眼前快速闪过一个彩色碟片，要求被试者猜测碟片的颜色。

在两个试验中，盲人志愿者都能正确猜测出物体的特征，并且其正确率比单凭机会猜测的要高得多。

这与盲视的定义相吻合，同时也对这种可能性的出现提出了质疑。

罗说："我们相信的事情正在发生，正如试验中所显示的那样，通过对大脑进行无意识层面的加工，被试者能够描述出物体放置的方向和物体的颜色。"

"我们相信从眼部到大脑间存在着传导通路，这些传导通路绕过常规路径试图有意识地对信息进行加工。"

他还补充说，这项研究对传导通路通向大脑内部的视觉中心这一理论是一个有力的支持，人类大脑内部的视觉中心比所有哺乳动物普遍拥有的视觉中心都要复杂得多。这就暗示，或许只有更高等物种才有传导通路。

同时试验结果还显示，这些自愿者只要对猜测抱有更充足的信心，结果就更准确。

罗说："这到底体现着什么还不甚明朗，但是我们认为这反映了这种无意识的加工系统可以提高确定感。"

在随后的试验中，研究小组将测试为何在猜测过程中会出现自信心程度不一的情况。罗说道："或许是因为一些人更擅长这种无意识的加工处理。"

核心词汇

blindsight ['blaindsait] *n.* 盲视

cortex ['kɔ:teks] *n.* 皮制，脑皮层

essential [i'senʃəl] *adj.* 必要的，重要的

consciousness ['kɔnʃəsnis] *n.* 意识，知觉

stimulation [ˌstimju'leiʃən] *n.* 刺激，激励

induct [in'dʌkt] *vt.* 引导，引入

noninvasive [ˌnɔnin'veisiv] *adj.* 非侵害的，无损害的

compelling [kəm'peliŋ] *adj.* 令人信服的，引人注目的

prevalent ['prevələnt] *adj.* 流行的，普遍的

purposefully ['pə:pəsfuli] *adv.* 有目的地，自觉地

unethical [ʌn'eθikl] *adj.* 不道德的

induce [in'dju:s] *vt.* 促使

bar [bɑ:(r)] *n.* 棒子，横木

disc [disk] *n.* 碟片，圆盘

definition [ˌdefi'niʃən] *n.* 定义

discriminate [dis'krimineit] *vt.* 区别，差别

pathway ['pɑ:θwei] *n.* 路，径

accurate ['ækjurit] *adj.* 准确的，精确的

varying ['vɛəriŋ] *adj.* 不同的

Biological Rhythms

39. 生物节律

机经选粹

这一篇是介绍节奏的自然周期对动物的影响的文章。具体说明了光和四季变化对生物的影响，同时还解释了导致自然节奏变化的因素：昼夜交替是由地球自转引起的，四季更替则是由地球围绕太阳公转引起的。

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Biological Rhythms

As living organisms on earth, we are exposed to a number of rhythmic, environmental changes caused by the planet's movements. As the earth moves around the sun, we witness the different seasons. As the moon revolves around the earth, we witness the changing tides. And as the earth moves on its axis, we witness night and day. We too have our own cycles, or biological rhythms, that help to keep us in tune with our planet, thus ensuring the survival of our species.

Biological/circadian rhythms

A biological rhythm is considered to be any cyclic change in a person's behavioural or physiological functions, occurring at regular intervals. Such biological rhythms in humans include:

· heart rate

· breathing

· hormone secretions

· menstrual cycle

· core body temperature

· sleep/wakefulness cycle



Most of these rhythms are controlled by our "bodyclock", and will maintain a constant pattern, even in the absence of environmental cues/stimuli. For instance, if a woman is placed in a controlled environment, where there is no change in light or temperature, she will still menstruate every 28 days. Such rhythms are known as endogenous.

If an endogenous rhythm has a period of approximately 24~25 hours, it is also known as a circadian rhythm. (The word circadian is from the Latin circa, meaning "about", and diem, meaning "day".) A good example of a circadian rhythm occurring in humans is that of core body temperature. Whilst core body temperature stays constant at 37 °C, it does gradually rise and then fall by approximately 1 °C during a 24 hour period.

Ordinarily, body temperature is at its coolest during the very early hours of the morning when we are asleep. It then begins to rise somewhere between 6~7 a.m., in order to prepare the body for its daily activities, and continues to rise very slightly throughout the day before eventually peaking in the afternoon/early evening and starting its gradual descent at around 6~7 p.m. By early morning, the whole cycle starts over again—with or without environs—mental cues, such as daylight.

However, in order for us to live in harmony with our planet and its seasons, our circadian rhythms (which are only approximately 24 hours in length) need to be synchronised with those of our environment. This is achieved through cues which are known as Zeitgebers (derived from the German zeit, meaning "time", and geber, "to give"), of which daylight is perhaps the most influential.

But to what extent do these various biological rhythms actually have an impact on sports performance?

Performance=p.m.

Performance seems to be closely linked to one circadian rhythm in particular: core body temperature. Generally speaking, muscle strength and reaction times peak at the same time as core body temperature, namely late afternoon/ early evening, which makes this the ideal time of day for training and competing. (Obviously, this can be problematic if competing in a hot country, in which case sports events—particularly those involving endurance, such as marathons—would be better scheduled in the morning. Sadly, though, the timetabling of sports events is often dictated by the large television companies providing media coverage.)

Interestingly, an athlete's perception of time seems to be accelerated by raised levels of body temperature. This means that if an athlete was asked to count to from one to sixty at what s/he perceived to be one-second intervals, s/he would typically complete the task in a shorter amount of time in the afternoon (when his/her body temperature

is higher) than in the morning. This could potentially mean that athletes will push themselves harder when performing in the late afternoon/early evening, as they believe that more time has lapsed than it actually has. However, this theory is only hypothetical, and it remains unclear as to whether such a phenomenon influences an athlete's subjective evaluation of 'speed'.

Accuracy=a.m.

Conversely, it would seem that sports requiring a high level of accuracy and/or hand-steadiness as opposed to speed and muscle strength may be better performed in the morning, when core body temperature is lower. This would be particularly relevant to those taking part in sports that require poise and balance, such as gymnasts. Darts and snooker players may also benefit from early competition times, but again, such events are often held in the evening to coincide with peak viewing times.

Asthmatics and people with coronary problems are advised against performing strenuous exercise in the early morning (e.g. before 9 a.m.) as airway resistance increases, pulmonary diffusing capacity decreases, and myocardial spasms and angina pains are induced more easily at this time of day.

Post-lunch dip

Most people, and not just sports partici pants, show a temporary decline in alertness and performance in the early afternoon, which is commonly referred to as the "post-lunch dip". Whether actually eating a meal is responsible for this lull remains unclear. What is clear, however, is that early afternoon is not the ideal time to impart new skills or tactics to athletes.

The travelling athlete

Very few biological rhythms remain unscathed when the athlete crosses several time zones in an aeroplane in order to take part in overseas competitions. An athlete will experience jet lag whichever direction the plane is travelling in, but generally it is easier to cope with flying in a westward direction compared to flying eastward. This is because an athlete travelling east "loses" time, and thus will need to advance his/her bodyclock in order to synchronise with the new environment. When travelling west, the bodyclock simply needs to be delayed—something which is much easier to achieve.

Ideally, the professional athlete should arrive in the host country at least one day in advance of the competition for every time zone crossed. This will allow him/her adequate time to re-synchronise his/her biological rhythms and thus adjust more fully to the new time-zone.

It is recommended that training in the first few days should not be too arduous, as this may lead to accidents or injuries.

For athletes who feel sleepy during the day (when they would have ordinarily been asleep back home), exposure to sunlight can be a useful antidote. Gentle exercise in itself is also a good stimulant and re-synchroniser, so activity as opposed to long naps should be encouraged when the athlete feels drowsy during the first few days. Putting off long naps when it should also help the athlete to sleep at nightfall.

Sleeping pills are not recommended for athletes who are having difficulty sleeping at night in the new time zone. Whilst such drugs will almost certainly help the athlete to sleep, the potential problem is that she/he may not be fully alert and able to perform at optimum level the following day.

Athletes who are particularly anxious about getting a good night's sleep should be reminded of times when their performance was not impaired following a disturbed night's sleep. It is also worth bearing in mind that partial sleep loss is far less detrimental to performance than total sleep deprivation, the latter of which is not very common. And, of course, merely being anxious about getting sleep can be enough to prevent it!

Athletes who are particularly anxious about getting a 'good night's sleep' should be reminded of times when their performance was not impaired following a disturbed night's sleep. It is also worth bearing in mind that partial sleep loss is far less detrimental to performance than total sleep deprivation, the latter of which is not very common. And, of course, merely being anxious about getting sleep can be enough to prevent it!

The use of simple aids such as ear plugs and eye masks should be considered when staying away from home—even in the UK—as it can be difficult to sleep when surrounded by unfamiliar noises, etc.

Menstrual Cycle

The female body undergoes a number of physiological changes during the various stages of the menstrual cycle, all of which could potentially have some impact on exercise and performance. For instance, it is quite typical for a woman to experience: a 0.5°C rise in core body temperature during ovulation; weight gain/loss; and abdominal cramps. However, it would seem that, overall, the menstrual cycle has very little impact on an athlete's performance: retrospective studies have shown that women have achieved Olympic gold medals and set world records at all stages of the menstrual cycle. It has even been suggested that performance may actually improve

during the luteal phase (post-ovulation/pre-menstruation) of the menstrual cycle. From a psychological point of view, it is interesting to note that positive moods are evident during the post-menstruation/ovulatory phases of the cycle, whilst negative moods are prominent during the pre-menstruation/ menstruation phases. Such mood factors can obviously have a huge impact on the athlete's attitude and motivation, which in turn can affect her overall performance. And yet while PMT is thought to be less common in athletes than non-sports participants, it would appear that women in general are more susceptible than normal to injury during the premenstrual phase.

It should be noted that the menstrual cycle can be affected by strenuous sports training programs, resulting in delayed menarche (menstruation does not begin at the expected age) and secondary amenorrhea (the prolonged absence of periods in women who have already started menstruating).

Much of the information contained in this article was obtained from: Biological Rhythms and Exercise by T. Reilly, G. Atkinson, and J. Waterhouse (Oxford University Press, 1997). *For a review of this book, turn to page 8.*



作为地球上的生物，我们会受到一系列由行星的运动引起的周期性的环境变化的影响。当地球绕着太阳不停地转动，我们可以看到一年四季的变化；而月亮又绕着地球转动，因而我们能够看到潮涨潮落；由于地球绕地轴自转，我们可以目睹白天和夜晚的交替。我们也有自身的周期变化，或者说是生物节律，以帮助我们与所在的行星保持协调，从而确保人类自身能够生存。

生物/生理节律

生物节律是指人的行为或者生理功能的一种周期性变化，它按照规律的时间间隔发生。这种人体生物节律包括：

· 心率
· 呼吸
· 激素分泌
· 月经周期
· 核心体温
· 睡眠周期/觉醒周期

这些节律大部分由我们的“生物钟”所控制，即使缺省外界环境的影响或者刺激，它们也会保持这种恒定模式。例如，如果使一位女性处于一个受控制的环境里——没有光线

和温度的变化——每隔28天，她仍会月经来潮。这种节律是内源性的。

如果一种内源性节律的周期大约是24~25小时的话，它也可以叫做昼夜节律。(单词“circadian”起源于拉丁语，“circa”是“大约”的意思，而“diem”是“一天”的意思。)发生在人体内的昼夜节律其很好的一个例子就是核心体温。当核心体温保持在37°C的时候，在24小时内，它会逐渐上升然后下降，在1°C左右的范围内波动。

通常，在凌晨我们还处于睡眠状态的时候，体温最低。然后到了大概早晨6~7点的时候，为了让我们的身体预备好应对日常生活活动，体温开始有所上升，并且全天一直保持这种小幅上升状态，直到中午或者傍晚的时候，人体体温达到最高点，然后大约在晚上6~7点的时候，又开始逐渐地下降。到了凌晨，无论伴不伴随环境心理暗示，比如说日光，整个循环会再次开始。

然而，为了让我们可以与地球及其季节变化相协调，我们体内的昼夜节律(大约只有24小时的长度)必须和我们所处的环境同步。这是通过被称作为同步因素(来源于德语，“zeit”意思是“时间”，“geber”的意思是“给予”)的一些提示信号来完成的。在这中间，日光也许是最有影响力的。

当运动员乘坐飞机跨越几个时区去国外参加比赛时，他们的生物节律很少不被打乱。无论飞机飞向哪一方位，他们都会遇到时差问题，但是总地来说，向西飞行比向东飞行更容易克服飞行造成的时差问题。这是因为向东飞行的时候，由于时差的原因，运动员的时间会提前，因此他需要将生物钟提前以保持和新环境的同步。但是当向西飞行的时候，就需要延迟生物钟，而处理这个问题则简单得多。

理论上讲，一个专业运动员无论跨越哪个时区，都应该提前至少一天到达比赛的东道主国。这样，就有足够的时间来重新调整他/她的生物节律，以保持和当地的同步，更加适应新的时区。

建议运动员在开始的前几天不应该做高强度的训练，因为这可能会导致意外伤害。

对于那些在白天会感到昏昏欲睡的运动员(通常这时在家睡觉的)来说，接受阳光的刺激是对抗瞌睡的很有效的办法。做一些不太激烈的运动本身也是保持清醒、重新适应新环境的好方法。因此，当运动员在头几天感到昏昏欲睡的时候，多做一些运动应该可以帮助抵抗长时间的打盹。克制住白天不睡觉还可以让他们晚上睡得更好。

运动员到了新的时区后，即使晚上失眠，也不建议吃安眠药。虽然这些药在很大程度上可以帮助他们入睡，但是也会存在隐患，第二天他们可能不能完全清醒，表现也可能不会达到最佳状态。

如果有的运动员对于在晚上能否睡个好觉感到尤为担心的话，应该提醒他们，他们的表现并不会受一次的睡眠不好影响。而且还要提醒他们，与整夜不睡相比，部分时间没睡好对他们接下来的表现所带来的影响非常小，但是整夜无眠的现象并不是很常见。当然，如果只是担心能否休息好，这是足以克服的。

当我们出门在外的时候，应该考虑使用一些辅助手段来帮助睡眠，比如使用耳塞或眼罩，即使在英国，我们也可以这样做。因为当周围有一些陌生的噪声时，我们是很难入睡的。

月经周期

在月经周期的不同阶段，女性的身体要经受许多生理上的变化，这些变化都可能会

对其运动或者表现有一些影响。例如，女性很有可能会有这样一些典型的表现：在排卵期间，核心体温会增加0.5°C；体重会增加或减少；还会有痛经现象。但是，我们可以发现，一般来说，月经周期对一个运动员的影响比较小：过去曾有研究显示，女性运动员在月经周期内的不同阶段都曾得到奥林匹克金牌，创造过世界纪录。还有一些人甚至认为在黄体期(排卵期后或者是经期前)，女性的表现会更加出色。从心理学角度来讲，在月经后或者排卵期间女性的心态如此积极，而在月经前或者月经期间不良情绪则十分显著，这是一个很有趣的现象。这些情绪因素对一个运动员的心态和积极性有很大的影响。反过来，它也会影响她整个的表现。尽管经期前紧张症状对于运动员来说不像非运动员那样常见，但似乎在经期前，女性通常会比平常更容易受伤。

核心词汇

revolve [ri'vɔlv] *vi.* 旋转
rhythm ['riðəm] *n.* 节奏，韵律
circadian [sə:'keidiən] *adj.* 生理节奏的
core [kɔ:] *n.* 果心，核心
wakefulness ['weikfulnis] *n.* 觉醒，不眠
menstruate ['menstrueit] *vi.* 月经来潮，行经
descent [di'sent] *n.* 降落，侵袭
environs [in'vaiərənz] *n.* 附近
host [həust] *n.* 主人，东道主
recommend [rekə'mend] *vt.* 建议，推荐
arduous ['ɑ:djuəs] *adj.* 费力的，辛勤的
synchroniser ['siŋkrənizər] *n.* 同步指示仪
nap [næp] *n.* 小睡，打盹
nightfall ['naitfɔ:l] *n.* 傍晚，黄昏
partial ['pɑ:ʃəl] *adj.* 部分的，偏袒的
ovulation [ɔvju'leiʃən] *n.* 排卵，产卵作用
abdominal [æb'dɔminl] *adj.* 腹部的
retrospective [ˌretrə'spektiv] *adj.* 回顾的，怀旧的
ovulatory ['ɔvjulətəri] *adj.* 产卵的，排卵的
premenstrual [pri:'menstruəl] *adj.* 经期前的

Our Evocative Sense of Smell

40. 我们觉醒的嗅觉

机经选粹

这一篇是关于taste和smell的文章。文章中术语比较多，难度较大。

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Our Evocative Sense of Smell

"The most peculiar thing about smell is its particular susceptibility to fatigue," says Dr Abdullah Sani Mohamed, an associate professor and ENT (ear, nose and throat) surgeon at University Kebangsaan Malaysia.

This means that after 5 to 10 minutes of exposure, one would lose scent of a bottle of Eternity or become immune to an onslaught of Obsession.

As Dr Abdullah Sani puts it: "When a strong perfume or stench continues to trigger a nerve, it can get tired or fatigued. This enables garbage collectors or workers at a sewage treatment plant to adapt to and not wrinkle their noses at the stink after a while."

"The effect wears away," he says, "if they get away from the pungent smell for around 30 minutes to one hour." "Our other senses," he says, "are not able to emulate this. For example, if you prick yourself 10 times, the 10th prick will still be as painful as the first one."

Some do say, however, that the "smell" of success never wanes. But apparently the "taste" of success is quite another thing.

Those who depend on their noses for a living like perfumers, winetasters who inhale the bouquet of wines, and jungle trackers, know that this kind of fatigue does not apply in the case of small doses or subtle odours.

But the rest of us may take our olfactory receptors rather for granted,particularly when it seems to be the sense that we can spare most. Many of his patients, Dr Abdullah Sani says, live without it.

However, it's best, he cautions, to seek medical advice when one discovers a change or abnormality in one's sense of smell as this may indicate a polyp or growth in the nose, a condition that may be curable.

No doubt, humans have the least powerful sense of smell compared with the rest of the animal kingdom because unlike the carnivores, say, we do not rely heavily on it to locate food or to warn against predators.

Yet, our sense of smell is said to be 10,000 times more sensitive than taste. And we are able to train our smell receptors to appreciate a widening vocabulary of odours which can be categorised under six main types: fruity, flowery, resinous, spicy, foul and burned.

Depending on a person's sensitivity to smell, one can distinguish between 5,000 and 10,000 or more smells, fair and foul. People often turn up their noses at things like durians, dung, fumes, petrol, cigarettes and rotten eggs. Then again, a catalogue of our favourite fragrances include durians, petrol, cigarettes, babies, freshly-cut grass, rain, money, frangipani, roast chicken, steamed fish and coffee.

As Jean Lenoir, a wine writer, wrote keenly in *Le Nez du Vin (The Nose of the Wine)*: "An experienced taster may describe, as one did with a St Emillion 1970, having a latent aroma of mint, with touches of cinnamon and blackcurrant or another describing a white burgundy as dominated by fragrances of fresh almond, vanilla and lemond peel."

In some languages, the nose implicates emotions. The French say "Je ne peux le sentir", translated literally as "I cannot smell him", when they talk about someone they dislike while the English use expressions like "nosy", "putting one's nose out of joint", "with one's nose in the air", "rubbing one's nose in it "and "turning up one's nose".

Even researchers have nosed in on the action, talking about "sperms navigating by sense of smell, sniffing their way to fertilise an egg" and the vomeronasal system (as opposed to the olfactory system) that responds to pheromones, an unconscious "smell" or cloud of odourless chemicals that affects sex appeal and matters of reproduction.

Ruth Linton of the BBC's World Service's Science Unit reports that smell receptors trigger mood centres in the brain. That is why, she says, smell has such a powerful

and immediate effect on our emotions and memories.

Because of this, the ancient art of aromatherapy uses the natural aromatic essences or oils that are found in plants to calm or stimulate. Like sounds, pleasant smells soothe while unpleasant ones agitate. So, when we stop to smell the flowers, we probably receive more than pleasure and pollen in return.

A lot of people think that smell—underarm odour in particular is a very personal thing. So it is. One's own odour is as unique as one's fingerprint or DNA. Indeed, the speed with which a newborn child is able to distinguish the personal smell of its mother is astonishing. Similarly, mothers have displayed the ability to identify their babies by smell.

Leading French aromatherapist Daniele Ryman, who was made out to be a witch or mad eccentric when she began her practice in 1967, claims to be able to diagnose people just by smelling them.

This chemo-perception has nothing to do with the external design of the nose, prominent as it may be and whether it be hooked, flared, perfect for snuff, long and narrow, snub or broad. Its external shape is more a form of environmental protection.

A long, narrow nose serves as a better humidifier in deserts, mountainous regions and the Arctic than a short, broad one, which is adequate in the damp tropics. In addition, what we see as the nose serves an aesthetic purpose. In some cultures, people rub noses instead of kissing.

Scientifically speaking, all one needs to smell, or for olfaction (smell), are chemically-sensitive nerves with endings in the lining (epithelium) of one's nasal cavity. "Actually," Dr Abdullah Sani admits, "medical science is still rather unclear as to how olfaction works."

"Theory has it that odorous molecules, which are carried into the nasal cavity when one breathe or sniffs, come into contact with the relevant nerve cells or endings and somehow generate corresponding electrical energy that is transmitted to the brain." This, however, does not explain why smell is so closely interrelated with taste.

"Smell affects taste and taste affects smell," Dr Abdullah Sani confirms. "One can safely say that if you lose your ability to smell, your capability to taste will be reduced by at least 50 per cent. And vice versa."

Humans have two distinct classes of chemoreceptors: taste (gustory) receptors in the tongue's taste buds and olfactory receptors.

Lenoir describes their relationship: "Our impulses tell us that the sense of taste lies in the mouth. If this were so, a mouthful of wine would tell us all there is to know about it. In fact, we smell tastes, rather than tasting them with our lips, tongues and palates."

"Our mouth discerns the cruder' sensations such as sweet, sour and so on, but it is the olfactory bulb in the upper cavity of our nose which tells us the subtleties of what we are tasting."

When one's sense is lost, one or more of the others usually develop in compensation. Ryman was terribly short-sighted as a baby but refused to wear spectacles until she was 16 years old and believes that this was one of the factors that led to her extraordinarily perceptive sense of smell.

"It's easier," Dr Abdullah Sani says, "to lose your smell rather than your taste." "Factors," he says, "such as a high viral fever, which may damage the olfactory nerves, or any physical obstruction like polyps or tumour (in the nose) or a bent septum (partition between nostrils) preventing the odorous particles from getting up the nose, can cause a temporary or permanent loss of smell, while a growth or tumour in the frontal lobe (of the brain) can either cause you to lose your smell by knocking off the nerves concerned, or change bad smells into good ones and nice odours into nasty ones."

The common cold, he adds, can also cause a temporary loss of smell when the secretions cause the lining of the nose to be engorged, physically impeding the olfactory pathway. Apart from tastebuds that are considerably diminished by the loss of smell, Dr Abdullah Sani says, a person would have to damage both his middle ears before he loses his sense of taste.

Smells of onions and ammonia, however, take another sensory pathway altogether, triggering different nerves in the sides of the nose which are also connected to the eyes, causing tears as a reflex action. "Since this is more powerful than the normal effect of olfaction," Dr Abdullah Sani says, "it can be used to bring a person out of a faint or unconsciousness. You can lose your sense of smell but still retain this ability. "In a sense, it's more resistant than smell."



马来西亚国民大学副教授兼耳鼻喉外科医师阿卜杜拉·塞尼·穆罕默德博士指出："嗅觉最奇特的地方在于它特别感觉的疲劳性。"

这意味着暴露在味源下5~10分钟，人将感觉不到一瓶永恒香水的香味或是对着迷浓烈的味道无动于衷。

阿卜杜拉·塞尼这样解释："当一股强烈的香味或是恶臭持续触动人的神经，人的嗅觉将变



得迟钝或者疲乏。这也使得在污物处理厂工作的清洁工们在处理垃圾时逐渐适应了恶臭，过了一会儿再闻到恶臭时也不会皱起他们的鼻子。”

他说道：“如果他们远离这种刺鼻的臭味大约30分钟到1小时，这种效应就会逐渐地消退。”他继续说道：“我们其他的感官不能与此相效仿。比方说，如果你用针刺自己10下，第10次疼痛的感觉和第1次的没什么两样。”

然而有些人会说道，嗅觉成果永不会衰弱，而对于味觉来说，显然又是另一回事。

一些以鼻子谋生的人，如香水调配师，品酒香的调酒师和丛林探险家们知道这种失灵在呼吸小剂量的或是微妙的味源时并不适用。

然而，据称人类的嗅觉比味觉灵敏1万倍。而且，经过训练，嗅觉可以分辨出很多气味，这些气味主要可以分成6大类：水果味、花香、树脂味、辛辣味、臭味和焦煳味。

依靠对气味的灵敏性，人类可以分辨出5,000~10,000种，甚至更多的气味，香味和臭味。人们通常不喜欢榴莲、粪便、煤烟、汽油、香烟和烂鸡蛋的味道。而人们喜欢的味道中也包括榴莲味、汽油味和香烟味，此外还有婴儿的奶味、新修剪的草的气味、雨味、钱味、素馨花味、炸鸡味、蒸鱼香和咖啡香。

正如品酒作家让·勒奴瓦在Le Nez du Vin(《酒之鼻》)中盛情写道：“一个富有经验的品酒师，当他遇到一瓶1970年的卡隆古堡干红时会这样描述——似一座未曾被发掘的香味之矿，触摸得到肉桂、黑醋栗的醇香——或是描述勃根蒂白葡萄酒时说此酒充溢着新鲜的杏仁、香草和柠檬片的悠悠清香。”

在一些语言中，有关鼻子的词语暗含感情因素。法语有云：“Je ne peux le sentir”，翻译过来就是：我闻不到他的味道；谈论不喜欢的人时，英国人会说“好管闲事的（直译：鼻子在空中的人）”，“打乱、扰乱别人的计划（直译：在某事中擦鼻子）”，“神气活现，自高自大，目空一切（直译：翘鼻子）”。

来自BBC的世界服务科学组的鲁思·林顿报道说，嗅觉感受器触动大脑中的情感中枢。她还说，这就是为什么嗅觉对人的情感和记忆有着如此强烈和快速的影响。

正因为如此，一项古老的技艺——香薰疗法使用在植物体内发现的自然香料和精油来镇定或刺激情绪。像声音一样，悦鼻的味道可以安抚烦躁的情绪。所以，当驻足嗅闻花香时，我们收获的也许不仅仅是好心情和花粉的味道。

许多人认为气味，特别是腋下的味道属于个人独特的气味。确实如此，每个人自身的气味就像各自的指纹和DNA一样是独一无二的。实际上，新生儿可以分辨出母亲的气味的速度令人惊讶。同样，母亲也可以凭借气味分辨出她们的孩子。

从科学的角度上来讲，人类需要闻气味，嗅觉的产生在于化学性敏感的神经，其底端处于鼻腔内部(上皮)。阿卜杜拉·塞尼博士承认：“事实上，医学科学仍未能解开嗅觉工作之谜。”

“理论上的解释是在呼吸或是吸入时，气味分子进入鼻腔和相关的神经细胞或与感受器端接触，以某种方式产生对应的电能传至大脑。”但是，这仍然未能解释为何嗅觉与味觉有如此紧密的关系。

“嗅觉和味觉相互影响，”阿卜杜拉·塞尼证实道：“可以确定地说，一旦人的嗅觉受损，那么其的味觉功能将会减退至少50%，反之亦成立。”

人类有两类显著的化学感受器：处于舌蕾的味觉感受器，以及嗅觉感受器。

勒奴瓦就它们的关系描述道："我们接受到的刺激告诉我们味觉来自于口腔。如果真是这样的话，满口的酒将告知我们应该知道的关于它的一切。事实上，我们是闻味道，而不是用我们的嘴唇、舌头和硬腭品尝它们。"

"我们的嘴巴可以分辨出天然的味道，如甜，酸，等等。然而正是鼻腔上部的嗅觉感受器告诉我们正在品尝的微妙的味道。"

当一种感觉受损，通常会在其他的一个或是多个感觉那里得到补偿。瑞门还是婴儿的时候患有严重的近视，但是一直到16岁她都拒绝配戴眼镜并且相信她的近视是促成她的嗅觉异常灵敏的原因。

阿卜杜拉·塞尼博士说道："失去嗅觉比失去味觉容易得多。"他说道："一些因素，像病毒引发的高烧会破坏嗅觉神经，或者鼻腔中的阻碍物如鼻息肉、肿瘤或是鼻道中弯曲的隔膜将会阻止气味进入鼻腔，造成暂时性或者永久性的嗅觉失灵。然而在大脑耳垂状前端的生长物或是肿瘤既会通过损伤相关的神经导致嗅觉的消失，又会将难闻的气味变成好闻的或是将芳香的气味变成难闻的。"

核心词汇

susceptibility [səˌseptə'biliti] *n.* 感受性，敏感性

fatigue [fə'tiːg] *n.* 疲乏，疲劳

onslaught ['ɔnslɔːt] *n.* 突击，猛击，猛攻

stench [stentʃ] *n.* 臭气，恶臭

sewage ['sju(ː)idʒ] *n.* 脏水，污水

emulate ['emjuleit] *vt.* 效法，尽力赶上

wane [wein] *vi.* 变小，衰退

tracker ['trækə] *n.* 追踪者

subtle ['sʌtl] *adj.* 微妙的，敏感的

odour ['əudə] *n.* 气味

receptor [ri'septə] *n.* 受容器，感觉器官

resinous ['rezinəs] *adj.* 树脂的，树脂质的

foul [faul] *adj.* 污秽的，邪恶的

durian ['duːriən] *n.* 榴莲果，榴莲树

fume [fjuːm] *n.* 臭气，烟

frangipani [ˌfrændʒi'pæni] *n.* 赤素馨花，赤素馨花香水

latent ['leitənt] *adj.* 潜伏的，潜在的

cinnamon ['sinəmən] *n.* 肉桂，肉桂树

vanilla [və'nilə] *n.* 香草

aromatherapy [ə'rəumə'θerəpi] *n.* 香薰疗法

epithelium [ˌepi'θiːljəm] *n.* 上皮，上皮细胞

chemoreceptor [ˌkeməuri'septə] *n.* 化学受体，化学感应器

palate ['pælit] *n.* 上颚，味觉

cavity ['kæviti] *n.* 洞，空穴，腔

obstruction [əb'strʌkʃən] *n.* 障碍，妨碍，闭塞

bent [bent] *a.* 弯曲的

septum ['septəm] *n.* 隔膜

The Seawater Greenhouse Generates Fresh Water, Grows Crops in the Desert

41. 海水温室造淡水，沙漠里面种庄稼

机经选粹

这一篇是说沙漠中净化海水的原理，在沙漠里建一温室让植物能在沙漠里生长得更好，提供更多的食物资源。

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The Seawater Greenhouse Generates Fresh Water, Grows Crops in the Desert

An innovative project that turns the normal function of greenhouses upside down has been garnering environmental awards. The Seawater Greenhouse uses seawater to cool and humidify the air that ventilates the greenhouse and sunlight to distil fresh water from seawater, enabling year round cultivation of high value crops that would otherwise be difficult or impossible to grow in hot, arid regions. Greenhouses were built in 1992 on the Canary Island of Tenerife, and in 2000 on Al-Aryam Island

in Abu Dhabi in the United Arab Emirates. The quality and quantity of crop production has been excellent in both cases, and the greenhouse has supplied more water than was needed for irrigation.

By combining natural processes, simple construction techniques and mathematical computer modelling, the Seawater Greenhouse thus offers a sustainable low-cost solution to the problem of providing water for agriculture in arid, coastal regions and a sustainable approach to desalinization.

The UK project won a Tech Museum 2006 Environment Award, the global annual Institute of Engineering and Technology (IET) award for Sustainability in 2006, and won second place in the prestigious St. Andrews Prize for the Environment in 2007.

The greenhouses are built of timber on a galvanised steel frame with polythene cladding, pipework and cardboard evaporators. All material are available locally, at low cost, and can be completely recycled. Air entering the greenhouse is cooled and humidified by an evaporator which provides good climatic conditions for crop growing. As the air leaves the growing area, it passes through a second evaporator which has hot seawater flowing over it heated from the greenhouse roof canopy. Fresh water condenses out of this hot and steamy air stream when it is cooled by water circulated through a condenser. The volume of fresh water is determined by air temperature, relative humidity, solar radiation, and the airflow rate.

Choosing the project as one of three finalists from 265 entries in the 2007 contest, the St. Andrews Prize for the Environment noted that this technology provides pure distilled water and food which could benefit more than 80 countries with arid regions near the sea, as well as areas of the world that face drought, salt infected soil, high temperatures and increasing shortages of groundwater.

The technology also inspired a dramatic 2005 design by Grimshaw Architects for a proposed redevelopment of the Las Palmas waterfront, in Grand Canaria, that would include a 3km promenade, botanic garden, and Water Theatre. The island's two unique geographic features—steep beaches which bring the deep ocean's cold water near to the shore so it can be siphoned off for air conditioning, and a steady wind direction that can be harnessed to produce fresh water—could create the world's first harbourside development that is entirely cooled and irrigated by natural means.

Grimshaw's architects believe biomimetic principles can be taken further, to generate new income as well as reduce running costs and resource use. They have designed a completely carbon neutral indoor botanical garden that could be built on an existing landfill site. For most of the year, the hothouse would be heated by solar heating through a glazed roof; in winter, additional

heating would come from the landfill biomass. Biodegradable waste, deposited in large vertical composting units flanking the building, would generate heat for the indoor garden, and could earn as much as £7m ($14m) a year by substituting for a landfill site—and the compost could be sold for agricultural use.

参考译文

一个将温室效应的功能完全倒置的创新方案已经获得环境方面的奖项。海水温室用海水将空气冷却并增加空气的湿度，使得温室内的空气流通，同时利用日光通过蒸馏法从海水中提取淡水，这样便能在炎热和干旱地区常年种植那些原本在那里很难或不可能生长的高价值农作物。1992年加纳利群岛中的特内里费岛上建造了温室，2000年阿拉伯联合酋长国阿布扎比的麦尔彦岛上也建造了温室。这两处温室的农作物的质量和产量一直很好，温室提供的水比灌溉所需要的水要多。

通过把自然过程、简单的建造技术和数学计算机模拟相结合，提供给海水温室一个可持续的低成本解决方法，解决了干旱的沿海区域农业供水问题，也为海水脱盐问题找到了一个可持续的解决方案。

英国的这个方案获得了2006年科技馆环境奖，也于2006年因其可持续性而赢得了工程技术学会(IET)的全球年度奖，并在2007年享有盛名的圣·安德鲁斯环境奖中获二等奖。

这个温室是将木材建造在一个由聚乙烯电镀层、管道和纸板蒸发器构成的镀锌钢架之上。所有材料都可在当地取材，成本低，并能完全地回收利用。进入温室的空气经由蒸发器冷却、加湿，为作物生长提供良好气候条件。当空气离开种植区域时，会通过第二个蒸发器，同时，使来自温室屋顶的檐篷并流经这个蒸发器的热海水加热。当循环流过冷凝器的水将空气冷却时，淡水便从这个热蒸汽流中凝结而成。淡水的体积是由空气温度、相对湿度、太阳辐射和气流率共同决定的。

在2007年的比赛中，当圣·安德鲁斯环境奖从265项入围方案中选择这个方案作为决赛的三甲之一时指出，这种技术提供了纯净的蒸馏水和食物，可使邻海的干旱地区以及世界上存在干旱、盐染土壤、高温和地下水日益短缺区域的80多个国家受益。

建筑师格雷姆肖在其2005年的一项引人注目的设计中，便被这种技术赋予了灵感。这项设计将包括一个3千米的长廊、植物园和水剧院，它是为大加那利岛的拉斯·帕尔马斯滨水地区拟议重建而设计的。该岛有两个独特的地理特征——陡峭的海滩，把深海的冷水带到附近的岸边，这样海水就可以被抽取来调节空气、稳定风向，风向可以用来生产淡水——能创造出世界上第一个完全通过自然手段冷却和灌溉的港口开发区。

格雷姆肖的设计师们相信，可以进一步运用生物模拟原理增加新的收入，

并能减少运营成本和资源的使用。他们设计了一个可以建在现有垃圾填埋场上的完全碳中和的室内植物园。这一年的大部分时间，将通过一个琉璃屋顶，由太阳能采暖为温室供热；而在冬天，额外的采暖将由垃圾填埋区的所有生物来产生。以大型立式堆肥单元的形式储存在建筑物侧面的可生物降解垃圾，它会为室内花园产生热量，而且可以通过替换一个垃圾填埋场，一年赚取高达700万英镑(1,400万美元)的收入——同时堆肥可以出售，用于农业。

核心词汇

garner ['gɑ:nə] *vt.* 贮藏，积累
humidify [hju(:)'midifai] *vt.* 使潮湿，使湿润
desalinization [disəlini'zeiʃən] *n.* 脱盐作用(淡化，减少盐分)
prestigious [ˌpres'ti:dʒəs] *adj.* 享有声望的，声望很高的
galvanise ['gælvənaiz] *vt.* 通电，镀锌
cladding ['klædiŋ] *n.* 金属包层法，电镀
evaporator [i'væpəreitə] *n.* 蒸发器
climatic [klai'mætik] *adj.* 气候上的
canopy ['kænəpi] *n.* 天篷，遮篷
airflow ['eəfləu] *n.* 气流
finalist ['fainəlist] *n.* 参加决赛者
distill [dis'til] *v.* 蒸馏，滴下
redevelopment [ri:di'veləpmənt] *n.* 再发展，重新开发，再开发
waterfront ['wɔ:təfrʌnt] *n.* 水边地，码头区，滨水地区
promenade [ˌprɔmi'neid] *n.* 公众散步的场所
siphone ['saifən] *vt.* 用虹吸管吸出或排出
botanical [bə'tænik(ə)l] *adj.* 植物学的
vertical ['və:tikəl] *adj.* 垂直的
compost [kɔmpəust] *n.* 混合肥料，堆肥

Integrated Farming System

42. 综合农业系统

机经选粹

这一篇讲的是一种把树木和农作物以及牲畜相结合的新方法，以及这种方法的效果和在全球的应用。

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Integrated Farming System

The Integrated Farming System (IFS) has revolutionized Conventional Farming of Livestock, Aquaculture, Horticulture, Agro-Industry and Allied activities in some countries, especially in tropical and subtropical regions that are not arid. Farming all over the world is not very performing unless relatively big inputs are added to sustain yields and very often compromise the economic viability as well as the ecological sustainability. Evidently, the situation can worsen if high duties are paid on imported materials and energy, and the polluter-payer policy is also applied, as it should well be.

The IFS can remove all these constraints by not only solving most of the existing economic and even ecological problems, but also providing the needed means of production such as fuel, fertilizer and feed, besides increasing productivity many-fold. It can turn all those existing disastrous farming systems, especially in the poorest countries, into economically viable and ecologically balanced systems that will not only alleviate poverty, but can even eradicate this scourge completely.

Integration

The ancient combination of Livestock and Crop activities had helped farmers in the past, almost all over the world, to use the manure as fertilizer for crops, and the crop residues as feed for livestock. However, most of the manure usually lost up to half its nitrogen content before it became nitrate and was readily available as fertilizer to plants. The quantity also became

inadequate as the population increased, so chemical fertilizers and artificial feeds had to be purchased, eroding the small profits of the small farmers.

The more recent integration of fish with the Livestock and Crop has helped to improve both the fertilizer and feed supplies, plus the higher market value of fish as feed and/or food increasing the incomes substantially. Technically, this important addition of a second cycle of nutrients from fish wastes has benefited the enhanced integration process, and has improved the livelihoods of many small farmers considerably. This has now been documented by M. Prein of ICLARM Malaysia in "Integration of Aquaculture into Crop-Animal Systems in Asia".

It should be noted that the first of the two cycles of nutrients from the livestock is used to fertilize the growth of various natural plankton in the pond as fish feeds. Yield of fish was increased up to three- to four-fold with polyculture of many kinds of compatible fish feeding at different trophic levels, as practised in China, Thailand, Vietnam, India and Bangladesh. The fish, after consuming the plankton, produce their own wastes that are converted naturally into the second cycle of nutrients, which is then used to fertilize various crops on both the water surface with floats, as practised in parts of China, and on the surrounding dykes.

However, even if this has been a big step forward, it still required some external input to increase farm productivity and produce processing in agro-industry. So it has remained inadequate to lift the small farmers out of poverty, because of the continuously rising costs of the inputs, such as chemical fertilizer, artificial feed and fossil fuel, which had adverse effects on yield and quality, produce processing, and farming economics. Further innovation as well as increased productivity are necessary to push the integrated farming system almost to perfection. This is what the ZERI (Zero Emission Research Initiative) Integrated Biomass System (IBS) has been trying to do, as documented by Gunter Pauli in *"Upsizing"*.

Digestion & Oxidation

The most significant innovation is the introduction of the DIGESTER & BASIN in the waste treatment processes of the integrated farming system. One big problem with livestock waste, which contains very unstable organic matter, is that it decomposes fast and consumes oxygen. So for any specific pond, the quantity of livestock wastes that can be added is limited, as any excess will deplete the oxygen and affect the fish population adversely, even resulting in fish kills.

We should also seriously question the erratic proposals, presently being made by local as well as foreign experts in Mauritius, while ignoring past failures worldwide and wasting scarce funding to repeat the same mistakes, such as: spreading the livestock wastes on land to let them rot away and hope that the small amount of residual nutrients left after losses of volatile ammonia and nitrite, if they are not washed away by rain or irrigation water, can improve the soil fertility; composing the livestock wastes with household garbage to get a low-quality fertilizer, again because of the ammonia and nitrite losses, instead of digesting the livestock wastes into higher-quality fertilizer,

and using the garbage to produce high-protein feeds such as earthworms and having their castings and garbage residues as better soil conditioner; and treating the livestock wastes ineffectively as well as inefficiently in outdated septic tanks for not much financial or other benefits, while the badly-treated effluent is just as dangerous as the waste itself.

Digestion of the livestock waste under closed anaerobic conditions, followed by oxidation in open shallow basins with natural algae providing the free oxygen through photosynthesis, before letting the treated waste effluent flow into the fish pond, can convert almost 100% of the organics into inorganics, which will not consume any oxygen to deprive the fish of this important life-sustaining item. So, theoretically, it is possible to increase the quantity of waste ten-fold into the pond without any risk of pollution.

Moreover, the big daily increase in readily usable nutrients can be beneficial to the system, provided that they are totally utilized in both fish and crop cultures, or they can create problems of eutrophication in bodies of water, including the fish ponds themselves, which are then counter-productive.

Role & Effect of Various Components of Ifs

Livestock—Whether it is for production of milk, egg or meat, small and big livestock require properly balanced feeding every day, and cannot continue to rely on rejected grains and their sweepings, cheap offals and residues from abattoirs and packing plants, and food remains from restaurants. It is worth emphasizing that, besides being comfortably housed and kept clean and dry, they must have those well-balanced rations in order to produce quality food products.

They also produce daily wastes, which are valuable renewable resources and will make various farming activities locally sustainable, even without any external inputs such as fossil fuel, chemical fertilizer and artificial feed. Worldwide, the latter have been relied upon to increase yield and even quality but at greater financial risks for those who have the means, but most of them just cannot afford them and remain poor farmers while the integrated farmers become rich by providing their own means of production on their farms.

However, feed can still be a serious problem in both quantity and quality. Most feeds can be locally produced from crops, crop and processing residues, with or without further processing for preservation or enhancement, but more nourishing ones such as earthworms, silkworms, fungi, insects and other organisms should also be constantly encouraged, some of them even producing high-value goods such as silk and mushrooms.

Digester—It is the most significant addition to farming during the past century, especially with livestock, which is mandatory for integrated farming systems. It can be as simple as a couple of concentric plastic bags of 5m3 capacity or 200-litre drums for a small farm, or a complex reinforced concrete or steel structure with UASB (upflow anaerobic sludge blanket) for maximum efficiency for a big farm or industrial enterprise.

It gives the best primary treatment to the livestock or organic wastes through isolation, settling, digestion, liquefaction

and solid/liquid separation, with the latter process enhanced with an additional but optional sedimentation tank, for a reduction in biochemical oxygen demand (BOD), which is a measure of the organic content in the waste, of 60% or more. Once the substrate is well conditioned biologically, with the methanogenic bacteria, which are naturally present in the intestines of humans and warm-blooded animals, taking over inside the digester, it is a continuous process.

As the fresh wastes enter the digester, the bacteria 'feed' on the organic content and transform the resulting unstable ammonia (NH_3) and nitrite (NO_2) into stable nitrate (NO_3), which is a nutrient readily usable as fertilizer. It only requires some stirring and clearing of floating matter at the inlet pipe by means of a plunger, with no addition of energy or chemicals.

In fact, as more wastes are added, the digester also produces an abundant and inexhaustible supply of biogas, a mixture of 2/3 combustible methane and 1/3 carbon dioxide, that is a convenient source of free and renewable energy for domestic, farming and industrial uses. Big farms, meat & fish packing plants, distilleries, and various agro-industries are now self-sufficient in energy, besides having big volumes of nutrient-rich effluent for fertilization of fish ponds, and 'fertigation' (fertilization & irrigation) of many kinds of crops, as described more fully below.

Oxidation—This oxidation process facilitates further treatment in low-cost shallow basins by aerobic (in presence of oxygen dissolved from the atmosphere or produced by natural algae through photosynthesis) means for another 30% of BOD reduction. So the effluent is almost fully treated when it is ready for discharge into the fish pond. In the tropical, but less in the subtropical, regions the high-protein chlorella algae grow prolifically, while supplying the free oxygen for treatment, and are used as additional feed for chickens, ducks and geese.

Fish Pond—Any residual organic matter from the livestock waste will be instantly oxidized by some of the dissolved oxygen in the fish pond, with hardly any adverse effect on the big fish population. Moreover, the nutrients are readily available for enhancing the prolific growth of different kinds of natural plankton as feeds for polyculture of 5~6 kinds of compatible fish. No artificial feed is necessary, except locally grown grass for any herbivorous fish.

As already mentioned, the fish produce their own wastes that are naturally treated in the big pond to give the second cycle of nutrients, which are then used by crops growing in the pond water and on the dykes. Such a highly-productive bonus is not available in any other farming system.

Where some fermented rice or other grain, used for alcohol production, or silkworms and their wastes used in sericulture, are available they are added to the ponds as a third cycle of nutrients, resulting in higher fish and crop productivity, provided that the water quality is not affected. More research and development are required to find more innovative systems of fish, shellfish and crop cultures to use up these nutrients, because any unused parts are potential pollutants. There is also a possibility to precipitate them and sell them as dry fertilizers.

Special diffusion pipes are now being tried with compressed air from biogas-operated pumps to aerate the bottom part of the pond to increase plankton and fish yields. A deeper pond than 3 metres of water is also being tried for the same objectives.

Crop Field—The IFS has a paradoxal situation where there is too much fertilizer, when it is lacking in other systems. and there is a need to find more ways of using it. Apart from growing vine-type crops on the edges of the pond, and letting them climb on trellises over the dykes and over the water, some countries have succeeded in growing some aquatic vegetables floating on water surfaces in lakes and rivers. Others have grown grains, fruits and flowers on bamboo or the longer-lasting polyurethane floats over nearly half the surface of the fish pond water, without interfering with the polyculture of 5~6 kinds of fish in the pond itself. Such aquaponic cultures have increased the crop fields by utilizing half of the millions of hectares of fish ponds and lakes in China. All this has been made possible because of the excess nutrients from the integrated farming systems.

Planting patterns have also been improved with the aquaponic culture. For example, rice is now transplanted into modules of 12 identical floats, one every week, and just left to grow in the pond without having to irrigate or fertilize separately, or to do any weeding, while it takes 12 weeks to mature. On the 13th week, the rice is harvested and the seedlings transplanted again to start a new cycle. It is possible to have 4 rice crops yearly in the warmer parts of the country, with almost elimination of the back-breaking work.

Another example is to do hydroponic cultures of fruits and similar vegetables in a series of pipes placed in a triangular shape, and have the highly mineralized pond water, enhanced with added missing elements, to run from the top through the other pipes, all holding the plants. This setup allows higher yields per unit surface area of the costly hydroponic building.

The final effluent is polished in earthen drains where macrophytes such as Lemna, Azolla, Pistia, and even Water hyacinth are grown to remove all traces of nutrients such as nitrate, phosphate and potassium before releasing the pure water to the aquifer.

Processing—One very big problem with market produce is the drop in prices when farmers harvest the same crops at the same time, and the big losses caused by unsold produce because of the glut. Simple processes such as smoking, drying, salting, sugaring, pickling, etc. should be taught to all farmers so that they do not spoil their surplus stocks. With the almost free access to abundant biogas energy, they can now have more sophisticated processing of their produce for both preservation and added value.

The importance of an adequate source of almost free biogas energy in the integrated farming system cannot be stressed enough, as most countries are short of this essential resource for economic as well as social development, especially in remote and isolated areas. Biogas will still be available when fossil fuels run out...

Residues—In the integrated farming system, there are more biomass such as stabilized digester sludge, dead algae, macrophytes, crop and processing residues. Considering

that livestock only use 15%~20% of the feeds they eat, and excrete the rest in their wastes, the latter can still be quite rich. So everything must be done to recycle them and make better use of their byproducts, which is what the IFS is actually doing.

The sludge, algae, macrophytes, crop and processing residues are put into plastic bags, sterilized in steam produced by biogas energy, and then injected with appropriate spores for high-priced mushroom culture. The mushroom enzymes not only break down the ligno-cellulose to release the nutritive ingredients, but also enrich the residues as more digestible and even more palatable feeds for livestock. The remaining fibrous residues can still be used for culture of earthworms, which then provide special protein feeds for chickens. The final residues, including the abundant worm castings, are composted and used for soil conditioning and aeration.



参考译文

综合农业系统(IFS)革新了一些国家的传统畜牧业、水产养殖、园艺、农产品加工业和相关的活动，尤其是在不太干旱的热带和亚热带地区。全世界范围内的耕作其可行性并不强，除非投入的力度相当大，足以维持产量，并时常调和经济效益和生态可持续性之间的冲突。显然，如果将更多的职责放在进口材料和能源上，并且采用以污染为代价获取经济发展的政策，那么形势可能会进一步恶化。

综合农业系统不仅可以通过解决大部分现有的经济甚至生态问题，还可以通过提供诸如燃料、肥料和饲料之类所需的生产资料，来消除所有的制约因素，除此之外，它还可以将生产力提高数倍。尤其在最贫穷的国家，它可以改善现有的极差的耕作制度，使其经济可行，并能促进生态系统平衡。这不仅可以缓解贫困，甚至能完全消除这一祸害。

古代，畜牧业和农作物种植相结合的方式曾帮助几乎全世界的农民使用家畜粪肥作为农作物的肥料和把农作物的残渣作为家畜的饲料。不过，通常大部分的家畜粪肥在变成含氮的硝酸盐可有效作为提供给农作物的肥料之前已经失去多达一半的氮含量。随着人口的增长，这些肥料日趋贫瘠，因此需要购买化肥和人工饲料，这无疑是利润微薄的小农雪上加霜。

近期，鱼、牲畜和农作物的一体化使得肥料和饲料的供应得以改善，并且鱼类同时作为饲料和食物，拥有较高的市场价值，使农民的收入大幅度增加。从技术上讲，这种来自于鱼类粪便的重要的二次营养循环的附加效益，不仅增进了整合进程，而且明显改善了许多小农的生计状况。如今这已得到马来西亚普赖因的国际水生生物资源管理中心的“亚洲农作物——动物一体化水产养殖系统”的证明。

值得注意的是，由家畜提供的两次周期中前一个周期的养料是为当作鱼饲料的池塘里各种各样自然浮游生物提供养料以供其成长。在中国、泰国、越南、印度和孟加拉国施行的以不同营养水平的鱼饲料混养鱼的实践中，鱼产量可以增加3~4倍。鱼消化浮游生物后的排泄物自然转化二次营养循环中，然后用于给各种农作物施

肥，这些农作物生长在有浮游物的水面。中国的部分地区和周边正采用这一方法。

然而，即使迈出超前的一大步，仍然需要一些外在投入以提高农业生产力和加快农产品加工业的生产流程。由于如化肥、人工饲料和矿物燃料等投入成本的持续上涨，对改善产量、质量、生产流程以及农业经济带来不利影响，因此小农无法充分摆脱贫困。进一步革新和提高生产力势在必行，它将完善综合农业系统，就像甘特·波利在《向上升级》中论证过的一样，这也是零排放研究活动综合生物系统当前的研究项目。

综合农业体系在废物处理过程中将家畜粪便引入沼气池和水池是最重要的创新。家畜粪便中包含有极不稳定有机质，这便存在一个大问题：它分解迅速并且需要消耗氧气。因此，对于任何池塘来说，能投放其中的家畜排泄物是有限的，因为任何超额增加量均会消耗氧气，给鱼群带来不利影响，甚至造成鱼的死亡。

目前由毛里求斯当地及外国专家提出建议，然而我们在忽略过去世界范围内出现的失误和浪费稀缺资金，重复同样错误的同时，也应该对这项奇怪的提案表示严重质疑，例如：将家畜排泄物置于土地上任其腐烂，并希望，如果它们没有被雨水或灌溉水冲走的话，氨和亚硝酸盐挥发后少量残余的营养素可以提高土壤肥力；将家畜排泄物和家用垃圾混在一起获得低质量的化肥，而不是将家畜排泄物掺进高质量的化肥中，这样同样会造成氨和亚硝酸盐的流失；利用这种混合垃圾培育诸如蚯蚓一样的高蛋白饲料，并将蚯蚓粪便及垃圾残渣用作土壤调剂物；禽畜排泄物的无效处理，以及无效置于无任何经济利益和其他好处的陈旧化粪池，加之流质无处理不当，那本身就和废物一样，是很危险的。

禽畜排泄物先在封闭式厌氧条件下进行发酵，随后再在敞开式浅水池中与通过光合作用提供自由氧气的天然海藻进行氧化作用，在经过处理的废水流入鱼塘之前，可以将几乎100%的有机物转化为无机物，这不会消耗任何维持鱼类生命的重要的氧气。因此，从理论上讲，有可能在不带来任何污染风险的情况下就可以使池塘里废弃物的数量增加10倍。

此外，每日大幅增加可随时使用的营养素，有益于此系统的运行。但前提是它们被鱼类和农作物完全吸收，否则，它们会促使水体产生一些问题，包括鱼塘富营养化，结果就会适得其反。

核心词汇

integrated ['intigreitid] *adj.* 整合的，综合的
livestock ['laivstɔk] *n.* 家畜，牲畜
subtropical [sʌb'trɔpikl] *adj.* 亚热带的
arid ['ærid] *n.* 干燥的，不毛的
scourge [skə:dʒ] *n.* 灾难，祸患
manure [mə'njuə] *n.* 粪肥，肥料
residue ['rezidju:] *n.* 残渣，剩余
nitrogen ['naitrədʒən] *n.* 氮
nitrate ['naitreit] *n.* 硝酸盐
plankton ['plæŋkt(ə)n] *n.* 浮游生物
fold [fəuld] *n.* 倍，倍数
dyke [daik] *n.* 沟，渠，堤坝
decompose [di:kəm'pəuz] *v.* 分解
adversely [æd'və:sli] *adv.* 逆向地，反对地
erratic [i'rætik] *adj.* 不稳定的，奇怪的
ammonia ['æməunjə] *n.* 氨，氨水
nitrite ['naitrait] *n.* 亚硝酸盐
anaerobic [,æneiə'rəubik] *adj.* 厌氧的
photosynthesis [fəutəu'sinθəsis] *n.* 光合作用
eutrophication [ju:,trɔfi'keiʃən] *n.* 富营养化

Gimme, Gimme, Gimme!

43. 给我食物！给我食物！给我食物！

机经选粹

这一篇基本都是讲大鸟怎么对待刚出生的小鸟的。

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Gimme, Gimme, Gimme!

A baby bird going "cheep, cheep" as its mommy flies home to the nest may not mystify the casual observer. Little tyke's hungry, wants some fresh worm. What's not to understand?

Nestlings may look hungry, but are they telling the truth?

An original thinker can see the mystery in the mundane, however, and some very original thinkers are asking complex questions about those cheeps.

Perhaps the biggest question has been, is this a crooked system? For example, might the babe be making that racket to con its parents out of more than its fair share of worm? If so, are its parents devious in return?

Or is this one of the so-called honest signaling systems, in which the cost of making all that fuss keeps the chick and its parents communicating accurately?

These ideas about chick-parent behavior grew out of the study of sexy animal parts, such as a peacock's tail. Such splendid ornaments clearly signal, "Hey, sweetie, be mine." The relative splendor or tattiness of that tail seems to give females an honest signal as to whether the male's a prime catcher or a loser. Most birds can't cheat and grow a finer tail than they deserve, biologists find.

Biologists have now set out to see if what they've learned about sexual signaling applies to the calls of begging offspring, not just in birds but in insects, mammals, and even plants. The answers concern the evolution of communication: how signals develop, interact with others, and then spread or fade away. All in all, there's been a remarkably large amount of research on whether or not a baby bird cheeps the truth.

Conflict of Interest

In the 1960s and 1970s, genetic studies caught up with the family troubles in "King Lear." Theorists proposed that the modest differences in genes between siblings and between a youngster and either of its parents invite conflicts of interest. A parent, equally kin in genetic terms to each child, might tend to invest equally in the children. Yet each of those little darlings would benefit from sabotaging that equal distribution.

Also from that era came the companion idea that an honest signal between animals, including such anatomical billboards as a peacock's tail, has to cost the signaler something. If any old bird could afford to grow an eye-popper of a tail, then abundant cheating would destroy the value of the signal.

These ideas suggested that babies in the nest have an incentive to manipulate their parents into provisioning them magnificently, even if the effort leaves the parent too worn out to tend to another chick or next season's young. Such conflicts in interest might drive the offspring toward evolving deceptive signals. However, the cost of the begging itself might keep false cheepers in check.

Baby-bird honesty raises three basic questions, according to a 1997 landmark review by Rebecca Kilner and Rufus Johnstone, both of the University of Cambridge in England. First, they asked, does a youngster's need influence the intensity of begging? Next, do parents respond in proportion to begging intensity? Finally, how much does begging cost?

At that time, they found the evidence mixed for each question.

The answer to the first question now seems to be yes, according to Marty Leonard of Dalhousie University in Halifax, Nova Scotia. She has reviewed recent findings while editing a book on begging, due out next year.

Tests in the mid-1990s, for example, showed that pigeon nestlings that had been recently fed didn't spend as much time begging as those that researchers had stinted. Likewise, food-deprived yellow-headed blackbirds called at a faster rate and called longer when they'd missed a meal than when they'd been fed on schedule.

Eggs beg too, it seems. Little noises come from white pelican eggs, and if the temperature falls just before hatching, the egg noises can speed up. Just like begging for food, these chirps for warmth intensify as the egg chills.

Chirping after hatching earns a chick a snuggle under a nice warm parent, so researchers propose that rapid chirps from eggs get them warmed, too.

For the second question—whether parents respond to a rising frenzy of begging—some experiments have indicated that the answer also may be yes, Leonard says. Pigeons dole out food to their brood in proportion to the youngsters' begging. Furthermore, tests in canary nests found that parents give more nourishment to food-deprived chicks.

One study of red-winged blackbirds failed to find any effect from intensified chick begging, but a more recent experiment did. In that test, reported in 1998 by Julie E. Burford and her colleagues at Beloit (Wis.) College, red-winged blackbirds delivered extra food to their nestlings when researchers enhanced the begging cacophony by broadcasting recorded chick calls for 5 minutes. However when researchers played white noise for 5 minutes, the parents didn't rush in any more food than when the nestlings squawked unassisted.

Tracking responses to different kinds of calls, Leonard and her collaborator Andrew G. Horn of Dalhousie University compared the power of begging squeaks from tree swallow nestlings that had been deprived of a meal or had been recently fed. The hungrier nestlings called more rapidly and frequently. Parents tended to make the first offer of food to a fake nestling near a speaker broadcasting the deprived-chick's call rather than one putting out a better-fed chick's call. The parents also made more total attempts to feed the fake chick with the deprivation call, the researchers reported in the January Behavioral Ecology and Sociobiology.

The researchers did a second experiment to work out just what made that hungrierchick's call so compelling. After electronically tweaking the calls in various ways and broadcasting them to parents, Leonard and her colleagues concluded that faster and more-frequent calling won extra attention from parents. Just getting louder didn't work.

In a different comparison of parental response, Nicola Saino of the University of Milan in Italy and her coworkers examined begging—this time from real barn swallow nestlings—linked to short-term or long-term troubles. The scientists created a short-term need by keeping otherwise healthy nestlings from getting a meal. For a longer-term problem, the researchers challenged a chick's immune system by injecting a foreign substance.

Parents tended to favor chicks with either difficulty, giving them a bigger share of the food than they gave less troubled siblings. Nestlings with neither short-term nor long-term troubles had to make do with less parental attention, the researchers reported in the December 2000 American Naturalist.

Feeding responses aren't just a bird thing. The meerkat, a kind of African mongoose that raises pups cooperatively within a group, also seems to succumb to the power of begging, Marta B. Manser of the University of Pennsylvania in Philadelphia reported in the November 2000 Behavioral Ecology and Sociobiology.

Meerkat pups don't stay in a nest but tag along after an older group member for hours at a time. As the older forager explores, the trailing pup or pups call repeatedly. Should the lead meerkat locate a tasty

scorpion or other invertebrate, a nearby pup switches calls, bleating faster, louder, and with a higher frequency. Watching meerkats and experimenting with recorded calls convinced Manser that pups pleading louder and more intensely got more of the bounty than less vocal youngsters did.

The last of the three questions—whether begging takes a toll on offspring—has proved to be the messiest issue. Leonard says that the metabolic demand of begging has proved relatively modest—less than 1 percent of the energy budget.

But researchers wonder whether begging incurs other costs. It might raise such a ruckus that it provokes attacks by predators.

Field experiments haven't revealed clear-cut results. For instance, predators molested fake western bluebird nests at ground level more often when the nests were broadcasting begging calls than when they were silent. Yet when the researchers put the nests in trees, they found no clear difference in attacks on noisy and quiet nests.

Good Ways to Whine

Additional questions are emerging. For example, can begging animals learn especially good ways to whine, much as babies discover the most effective ways to manipulate their parents?

The answer to that one may be an emphatic yes, according to Hilla Kedar's experiments hand-rearing house sparrows. She and her colleagues fed chicks only when they begged at a certain intensity, and the nestling house sparrows needed only a few hours to find the begging levels that got them the most goodies. Kedar, who's at Tel Aviv University in Israel, described the work in the September 2000 *Proceedings of the Royal Society of London B.*

Another issue is what to make of infants that squawk even when there's no parent nearby. That's the case for at least 15 percent of the begging calls from the southern grey shrike, noted Amber E. Budden at University of Wales in Bangor in the May *Behavioral Ecology and Sociobiology*.

Nestling barn owls have all-chick squawk-fests, too. Alex Roulin of the University of Bern in Switzerland proposed last year that with no parents around, the young owls appear to settle who'll get the goods when Mom or Dad does arrive. In Roulin's observations, at the actual dishing out of food, a nestling refrained from vocalizing if it had been fed more recently than a sib. Once that needy case was fed, however, the formerly restrained nestling started yakking.

Other researchers are looking at a variety of ways in which one chick influences the begging of its siblings.

Fights as well as begging can influence the parents' food appropriation, reported Bonnie J. Ploger of Hamline University in St. Paul, Minn., at the Animal Behavior meeting last July.

Her research team put Plexiglas dividers into notoriously raucous egret nests so all the chicks could see each other and get food from their parents but couldn't touch

each other. A hand warmer was tucked into each chick's partition to prevent chills. To ease the disruption they caused, the researchers took down the entire assemblage at the end of each research day so parents could warm the nest at night.

Egret parents brought home the same total amount of food regardless of whether or not the researchers had partitioned the nests. The partitioning did change the food distribution, however. The alpha chick, the oldest and brawniest, got the biggest share of food when it was free to beat up its siblings, but it snagged only a bottom-ranker's measure when partitions stopped the fights.

Without those fights, the second-ranked chick rocketed to the top of the food chain. Its mother preferentially gave it food, but its father showed no such favoritism. Ploger proposes that female egrets may have a built-in susceptibility to begging from chick number two.

Different Signals

A fundamental question has emerged from recent work: What's a begging signal? Many of the experiments to date have relied on sounds, but creatures communicate over various channels.

One is sight. When patches on the head of a young Western grebe flush red, parents seem more likely to feed the chick. Warbler parents, too, seem to select chicks for feeding according to the color. The hue of the chicks' gaping mouths varies with each young bird's immune condition.

Larval burying beetles also beg visually, making a waving motion when their parents appear. When parent beetles lay eggs, they provide a dead animal to nourish the young. As the eggs hatch and larvae grow, the parents feed their brood with regurgitated carcass.

When a female dart-poison frog hops up to the little pool where one of her offspring is growing, the tadpole usually starts swimming around. Mom lays eggs in the pool, which the tadpole gobbles. Does the tadpole's swimming a couple of laps signal either its need or worthiness for food?

Other senses may prove important, too. Baby ageienid spiders stroke their mother's mouthparts, and she regurgitates food for them. Is that tactile begging? And as seeds form in plants, they synthesize hormones that start the flow of resources from maternal tissue. Is this begging by chemistry?

For inquiring minds, that initial "cheep, cheep" is proving very rich.



参考译文

当雏鸟的妈妈飞回鸟巢时，雏鸟不停地"吱吱，吱吱"叫，这或许使不经意的路人有些难理解了。其实是小家伙饿了，想要一些新鲜的虫子。有什么不明白的？



尚未离巢的小鸟也许看上去饿了，但它们是在说实话吗？

然而，一位有独创见解的思想家可以看到这平淡中的奥秘，而且一些非常有创见的思想家正在提出关于这些吱吱叫声的复杂问题。

也许存在的最大的问题是，这是一个不诚实情形吗？例如，雏鸟制造那种喧闹会不会是为了哄骗它的父母从公平分配的虫子中给予它更多呢？如果是这样，它的父母也以不诚实来作为回应吗？

或者这是所谓的可靠信号体系之一吗？在这个系统中，制造那所有忙乱的价值是让雏鸟和它的父母进行准确无误的沟通。

这些关于雏鸟与父母间行为的想法产生于对迷人动物局部的研究，比如孔雀的尾巴。这种豪华的装饰物清楚地发出信号："嗨，亲爱的，你是我的。"尾巴的相对华丽或者破败不堪似乎向雌性传递出可靠的信号——这个雄性是一个一流的捕捉者还是一个失败者。生物学家发现，大多数鸟儿无法欺骗别人，也无法长出一条比它们应有的更漂亮的尾巴。

生物学家现在已经开始观察，他们已知的有关两性间信号的发送是否适用于幼仔的乞求声，这种声音不仅仅在鸟类中有，还存在于昆虫、哺乳动物，甚至是植物之间。答案涉及交流过程的发展：信号是如何产生，如何与其他动植物相互作用，然后又如何传播或者逐渐消失。总之，一直有大量关于雏鸟的吱吱叫声是否传达出真实情况的研究在进行。

野外实验还没有显示出明确的结果。例如，捕食者侵犯在地平面上冒充西部蓝鸲的巢穴，而且与鸟巢安静时相比，它们更频繁地侵犯有乞食声的鸟巢。但是当研究者把鸟巢放在树上时，他们发现对吵闹和安静鸟巢的袭击并无明显区别。

另外又出现了一些问题。例如，乞食的动物是学习特别有效的方式去哀叫还是像雏鸟那样找到最有效的方式控制父母为它们觅食呢？

根据希拉·科达尔的人工抚养家麻雀的实验，对于那个问题回答或许可以十分肯定地说"是"。她和她的同事只在雏鸟乞食到一定程度时才会喂它们，而且刚孵出的家麻雀只用几个小时就达到了得到最多美食的乞求水平。以色列特拉维夫大学的科达尔在2000年9月刊的《伦敦皇家学会学报B》中描述了该项成果。

另一个问题是当父母不在附近时，如何来理解嘎嘎大叫的雏鸟。事实上，至少15%的乞求声来自南方灰色伯劳鸟。威尔士大学班戈分院的安珀·E.布登在《行为生态学与社会生物学》5月的那一期里特别提到。

仓鸮的雏鸟们也会嘎嘎大叫。去年，瑞士伯尔尼大学的亚历克斯·鲁林推测：当父母不在周围时，小仓鸮似乎要决定当父母到来时谁将抢得食物。鲁林注意到，在实际分发食物的过程中，如果雏鸟被喂得比它的兄弟姐妹要勤一些的，它就会克制而不发出叫声。但一旦喂完饥饿的雏鸟以后，之前克制住叫声的它们又开始喋喋不休了。

其他研究人员正在观察雏鸟对它兄弟姐妹乞求声音影响的种种方式。

明尼苏达州圣·保罗的汉姆林大学的邦尼·J.普罗格里在最近7月的动物行为会议上做的报告称，争斗和乞求能够影响父母对食物的分配。

她的研究小组用树脂玻璃将众所周知声音嘶哑的白鹭巢隔开，这样所有的雏鸟都能互相看到，并从它们的父母那儿获得食物，却不能互相触碰。每个雏鸟隔间里都塞入了一只暖手炉以抵御寒冷。为了缓解他们造成的分离之苦，研究人员在每个研究日结束时便将整个装置拿下来，这样父母就可以在夜间暖巢。

不论研究人员是否将鸟巢分隔开，白鹭的父母都会带回家同样数量的食物。但是，分离的确改变了食物的分配。当最年长和最强壮的头等雏鸟与其兄弟姊妹自由地争斗时，得到了最大份额的食物，但当隔间阻止了争斗时，它抢到的只是最低等级的雏鸟所能得到的食物量。

在没有那些争斗时，二等雏鸟上升到食物链的顶端。它的母亲优先给它食物，但它的父亲并未表现出这样的偏爱。普罗格里提出，雌白鹭也许有对从二等雏鸟那里发出的乞求有一种内在的敏感性。

在最近的研究工作中出现了一个重要的问题：什么是乞求信号？到目前为止，许多实验一直从声音方面研究，但动物是通过各种各样的渠道来交流的。

一个是视觉。当一只小西方鹣鹛的头泛红时，父母似乎更有可能去喂这只雏鸟。莺的父母也似乎是根据颜色来选择雏鸟进行喂食。雏鸟张着的嘴的颜色根据每只小鸟免疫状态的不同而不同。

幼小的埋葬虫也从视觉上乞求食物，当它们的父母出现时，它们便做出摇晃的动作。父母产卵时，则用动物的尸体来喂养下一代。卵孵化，幼虫成长时，父母就用反刍出来的尸体来养育新生的幼虫。

当一只雌性的飞镖毒青蛙跳到养育着她后代的小水塘里时，蝌蚪通常开始在她附近游来游去。母亲在水塘里产卵，蝌蚪咯咯叫。蝌蚪游儿圈是表示它的需要或者相当于需要获得食物呢？

其他的感官也许也可以证实其重要性。小蜘蛛打击它们母亲的口器，母亲便把食物反刍出来喂它们。那是触觉乞食吗？种子发芽时，它们合成出荷尔蒙，使资源开始从母体组织中流出。这是通过化学作用乞食吗？

对于持怀疑态度的人来说，开始时的“吱吱，吱吱”的叫声表现出了十分丰富的内容。

核心词汇

casual ['kæʒjuə] *adj.* 偶然的，随便的

tyke [taik] *n.* 野狗

mundane ['mʌndein] *adj.* 现世的，世俗的

devious ['di:vjəs] *adj.* 迂回的

peacock ['pi:kɔk] *n.* (雄)孔雀

tattiness ['tætinis] *n.* 不整洁，简陋

interact [,intər'ækt] *vi.* 相互作用，相互影响

moleste [mə'lest] *vt.* 折磨，干扰

bluebird ['blu:bɜ:d] *n.* 蓝鸫

sparrow ['spærəu] *n.* 麻雀

shrike [ʃraik] *n.* 伯劳鸟，百舌鸟

refrain ['ri:'frein] *vt.* 节制，避免

sibling ['sibliŋ] *n.* 兄弟姐妹

notoriously [nəu'tɔ:riəsli] *adv.* 众所周知地

raucous ['rɔ:kəs] *adj.* 沙声的，粗声的

egret ['i:grit] *n.* 白鹭

partition [pɑ:'tiʃən] *vt.* 隔开，分割

alpha ['ælfə] *n.* 第一级

preferentially [prefə'renʃəli] *adv.* 先取地，优先地

regurgitate [ri(:)'gə:dʒiteit] *vt.* 使涌回，喷回

carcass ['kɑ:kəs] *n.* 尸体

tadpole ['tædpəul] *n.* 蝌蚪

mouthpart ['mauθpɑ:t] *n.* (昆虫等的)口器

Perfume
44. 香水

机经选粹

这一篇是讲对香水的研究。讲了合成香水的发展，人们对香水的需求量大，但是合成香水并不好。还介绍了由天然植物提炼的香水。

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Perfume

Background

Since the beginning of recorded history, humans have attempted to mask or enhance their own odor by using perfume, which emulates nature's pleasant smells. Many natural and man-made materials have been used to make perfume to apply to the skin and clothing, to put in cleaners and cosmetics, or to the air. Because of differences in body chemistry, temperature, and body odors, no perfume will smell exactly the same on any two people.

Perfume comes from the Latin "per" meaning "through" and "fumum," or "smoke." Many ancient perfumes were made by extracting natural oils from plants through pressing and steaming. The oil was then burned to scent the air. Today, most perfume is used to scent bar soaps. Some products are even perfumed with industrial odorants to mask unpleasant smells or to appear "unscented."

While fragrant liquids used for the body are often considered perfume, true perfumes are defined as extracts or essences and contain a percentage of oil distilled in alcohol. Water is also used. The United States is the world's largest perfume market with annual sales totalling several billions of dollars.

History

According to the Bible, Three Wise Men visited the baby Jesus carrying myrrh and frankincense. Ancient Egyptians burned incense called kyphi—made of henna, myrrh,



cinnamon, and juniper—as religious offerings. They soaked aromatic wood, gum, and resins in water and oil and used the liquid as a fragrant body lotion. The early Egyptians also perfumed their dead and often assigned specific fragrances to deities. Their word for perfume has been translated as "fragrance of the gods." It is said that the Moslem prophet Mohammed wrote, "Perfumes are foods that reawaken the spirit."

Eventually Egyptian perfumery influenced the Greeks and the Romans. For hundreds of years after the fall of Rome, perfume was primarily an Oriental art. It spread to Europe when 13th century Crusaders brought back samples from Palestine to England, France, and Italy. Europeans discovered the healing properties of fragrance during the 17th century. Doctors treating plague victims covered their mouths and noses with leather pouches holding pungent cloves, cinnamon, and spices which they thought would protect them from disease.

Perfume then came into widespread use among the monarchy. France's King Louis XIV used it so much that he was called the "perfume king." His court contained a floral pavilion filled with fragrances, and dried flowers were placed in bowls throughout the palace to freshen the air. Royal guests bathed in goat's milk and rose petals. Visitors were often doused with perfume, which also was sprayed on clothing, furniture, walls, and tableware. It was at this time that Grasse, a region of southern France where many flowering plant varieties grow, became a leading producer of perfumes.

Meanwhile, in England, aromatics were contained in lockets and the hollow heads of canes to be sniffed by the owner. It was not until the late 1800s, when synthetic chemicals were used, that perfumes could be mass marketed. The first synthetic perfume was nitrobenzene, made from nitric acid and benzene. This synthetic mixture gave off an almond smell and was often used to scent soaps. In 1868, Englishman William Perkin synthesized coumarin from the South American tonka bean to create a fragrance that smelled like freshly sown hay. Ferdinand Tiemann of the University of Berlin created synthetic violet and vanilla. In the United States, Francis Despard Dodge created citronellol—an alcohol with rose-like odor—by experimenting with citronella, which is derived from citronella oil and has a lemon-like odor. In different variations, this synthetic compound gives off the scents of sweet pea, lily of the valley, narcissus, and hyacinth.

Just as the art of perfumery progressed through the centuries, so did the art of the perfume bottle. Perfume bottles were often as elaborate and exotic as the oils they contained. The earliest specimens date back to about 1000 B.C. In ancient Egypt, newly invented glass bottles were made largely to hold perfumes. The crafting of perfume bottles spread into Europe and reached its peak in Venice in the 18th century, when glass containers assumed the shape of small animals or had pastoral scenes painted on them. Today perfume bottles are designed by the manufacturer



to reflect the character of the fragrance inside, whether light and flowery or dark and musky.

Raw Materials

Natural ingredients—flowers, grasses, spices, fruit, wood, roots, resins, balsams, leaves, gums, and animal secretions—as well as resources like alcohol, petrochemicals, coal, and coal tars are used in the manufacture of perfumes. Some plants, such as lily of the valley, do not produce oils naturally. In fact, only about 2,000 of the 250,000 known flowering plant species contain these oils. Therefore, synthetic chemicals must be used to re-create the smells of non-oily substances. Synthetics also create original scents not found in nature.

Some perfume ingredients are animal products. For example, castor comes from beavers, musk from male deer, and ambergris from the sperm whale. Animal substances are often used as fixatives that enable perfume to evaporate slowly and emit odors longer. Other fixatives include coal tar, mosses, resins, or synthetic chemicals. Alcohol and sometimes water are used to dilute ingredients in perfumes. It is the ratio of alcohol to scent that determines whether the perfume is "eau de toilette" (toilet water) or cologne.

The Manufacturing Process

Collection

Before the manufacturing process begins, the initial ingredients must be brought to the manufacturing center. Plant substances are harvested from around the world, often hand-picked for their fragrance. Animal products are obtained by extracting the fatty substances directly from the animal. Aromatic chemicals used in synthetic perfumes are created in the laboratory by perfume chemists.

Extraction

Oils are extracted from plant substances by several methods: steam distillation, solvent extraction, enfleurage, maceration, and expression.

In steam distillation, steam is passed through plant material held in a still, whereby the essential oil turns to gas. This gas is then passed through tubes, cooled, and liquified. Oils can also be extracted by boiling plant substances like flower petals in water instead of steaming them.

Under solvent extraction, flowers are put into large rotating tanks or drums and benzene or a petroleum ether is poured over the flowers, extracting the essential oils. The flower parts dissolve in the solvents and leave a waxy material that contains the oil, which is then placed in ethyl alcohol. The oil dissolves in the alcohol and rises.



Heat is used to evaporate the alcohol, which once fully burned off, leaves a higher concentration of the perfume oil on the bottom.

During enfleurage, flowers are spread on glass sheets coated with grease. The glass sheets are placed between wooden frames in tiers. Then the flowers are removed by hand and changed until the grease has absorbed their fragrance.

Maceration is similar to enfleurage except that warmed fats are used to soak up the flower smell. As in solvent extraction, the grease and fats are dissolved in alcohol to obtain the essential oils.

Expression is the oldest and least complex method of extraction. By this process, now used in obtaining citrus oils from the rind, the fruit or plant is manually or mechanically pressed until all the oil is squeezed out.

Blending

Once the perfume oils are collected, they are ready to be blended together according to a formula determined by a master in the field, known as a "nose." It may take as many as 800 different ingredients and several years to develop the special formula for a scent.

After the scent has been created, it is mixed with alcohol. The amount of alcohol in a scent can vary greatly. Most full perfumes are made of about 10%~20% perfume oils dissolved in alcohol and a trace of water. Colognes contain approximately 3%~5% oil diluted in 80%~90% alcohol, with water making up about 10%. Toilet water has the least amount—2% oil in 60%~80% alcohol and 20% water.

Aging

Fine perfume is often aged for several months or even years after it is blended. Following this, a "nose" will once again test the perfume to ensure that the correct scent has been achieved. Each essential oil and perfume has three notes: "Notes de tete," or top notes, "notes de coeur," central or heart notes, and "notes de fond," base notes. Top notes have tangy or citrus-like smells; central notes (aromatic flowers like rose and jasmine) provide body, and base notes (woody fragrances) provide an enduring fragrance. More "notes," of various smells, may be further blended.

Quality Control

Because perfumes depend heavily on harvests of plant substances and the availability of animal products, perfumery can often turn risky. Thousands of flowers are needed to obtain just one pound of essential oils, and if the season's crop is destroyed by disease or adverse weather, perfumeries could be in jeopardy. In addition, consistency

is hard to maintain in natural oils. The same species of plant raised in several different areas with slightly different growing conditions may not yield oils with exactly the same scent.

Problems are also encountered in collecting natural animal oils. Many animals once killed for the value of their oils are on the endangered species list and now cannot be hunted. For example, sperm whale products like ambergris have been outlawed since 1977. Also, most animal oils in general are difficult and expensive to extract. Deer musk must come from deer found in China; civet cats, bred in Ethiopia, are kept for their fatty gland secretions; beavers from Canada and the former Soviet Union are harvested for their castor.

Synthetic perfumes have allowed perfumers more freedom and stability in their craft, even though natural ingredients are considered more desirable in the very finest perfumes. The use of synthetic perfumes and oils eliminates the need to extract oils from animals and removes the risk of a bad plant harvest, saving much expense and the lives of many animals.

The Future

Perfumes today are being made and used in different ways than in previous centuries. Perfumes are being manufactured more and more frequently with synthetic chemicals rather than natural oils. Less concentrated forms of perfume are also becoming increasingly popular. Combined, these factors decrease the cost of the scents, encouraging more widespread and frequent, often daily, use.

Using perfume to heal, make people feel good, and improve relationships between the sexes are the new frontiers being explored by the industry. The sense of smell is considered a right brain activity, which rules emotions, memory, and creativity. Aromatherapy—smelling oils and fragrances to cure physical and emotional problems—is being revived to help balance hormonal and body energy. The theory behind aromatherapy states that using essential oils helps bolster the immune system when inhaled or applied topically. Smelling sweet smells also affects one's mood and can be used as a form of psychotherapy.

Like aromatherapy, more research is being conducted to synthesize human perfume—that is, the body scents we produce to attract or repel other humans. Humans, like other mammals, release pheromones to attract the opposite sex. New perfumes are being created to duplicate the effect of pheromones and stimulate sexual arousal receptors in the brain. Not only may the perfumes of the future help people cover up "bad" smells, they could improve their physical and emotional well-being *as well as their sex lives.*



参考译文

自从人类历史开始记载以来，人们已经开始通过香水来掩盖或者强化他们身上的气味。这些香水模仿的是来自于大自然中令人愉悦的气味。人们利用许多天然或人工材料制造出香水，然后将其喷洒在皮肤和衣服上，添加到清洁剂和化妆品中，或喷撒到空气中。由于每个人身体的化学作用、体温和体味都不一样，所以同一种香水在任何2个人身上，闻起来都不可能完全一样。

“香水”这个词来源于拉丁语“per”和“fumum”两个词，“per”是“经由……”的意思，而“fumum”在拉丁语中指的是“烟雾”。古代许多香水是由通过压榨和蒸馏的方式提取出来的天然植物油制成。那个时候，人们通过燃烧植物油使空气中充满香味。现在，大多数的香水被用于添加到块状肥皂中。一些产品甚至使用工业香料来掩盖它们本身难闻的气味，或者让自己闻起来好像没有气味。

人们通常把涂抹在身体上的有香味的液体称为香水，但真正意义上的香水是含有一定比例的从酒精中蒸馏出的油脂的萃取物和精华部分。水也是制造香水的原料。美国是世界上最大的香水市场，年销售总额达几十亿美元。

天然原料——如花、草、香料、水果、木材、植物根部、树脂、香脂、树叶、树胶、动物分泌物等，与酒精、石油化学制品、煤和煤焦油等原料一样，被广泛应用于香水生产过程中。一些植物，像铃兰，自己是不能产生天然精油的。事实上，25万种的知名花卉植物中大约只有2,000种含有这些精油。因此，人们必须用合成化学物质来创造这些不含精油的植物的香气。人们还可以用合成法来制造一些自然界原来并没有的香味。

一些香水原料来自于动物。例如，海狸香来自海狸，麝香来自于雄鹿，而龙涎香来自于抹香鲸。人们经常使用动物体内的香源制作定香剂以延缓香味挥发速度，延长香味散发时间。煤焦油、藓类植物、树脂以及合成化学制品等也可以用作定香剂。酒精、有时候也用水来稀释香水的成分。而正是其中所含酒精的比率决定了这种香水到底是“淡香水”(花露水)还是古龙香水。

由于香水制造在很大程度上取决于可获得的植物和动物原料数量，所以香水产业往往存在着很大的风险。从数千朵花中仅能得到一磅香精油。如果香料作物在某个季节因为疾病或者反常天气遭到破坏，香水制造业就会濒临险境。此外，天然植物油的香味浓度很难保持一致，同一物种的植物，生长在不同的地方，只要生长条件稍有差别，那么生产出的精油的香味也可能不是完全一样的。

在搜集天然动物油脂的时候也会遇到很多问题。许多动物曾经因为它们油脂的价值惨遭杀害，如今已经濒临灭绝，所以政府明令禁止捕猎这类动物。例如，从1977年开始，在抹香鲸上提取龙涎香就已经是非法行为。而且，绝大部分动物精油的提取技术难度大，成本高。只有从那些生活在中国的鹿身上，才能提取到鹿麝香；埃塞俄比亚正在人工饲养果子狸，因为它们的脂肪腺分泌物很有价值；人们还饲养加拿大和前苏联海狸，以获得海狸香。

尽管在制造最上乘的香水时，天然成分更为理想，但是合成香料让香料制造商在制

造香水时有更多的自由和稳定性。合成香料和油脂的利用免除了从动物体内提取油脂的需要，也排除了植物收成不好的风险，节约了很多开支，并且拯救了许多动物的生命。

如今，香水的制造方法和使用方法都与以前大不相同。现在越来越多的香水是由合成化学物质而不是天然油脂制成。不太引人注意的香水款式，现在也变得越来越流行。同时，这些因素降低了香水的成本，也促使它们在日常生活中得到更加广泛和频繁的使用。

用香水来治疗、使人心情愉悦，或者改善两性之间的关系已经成为香水制造产业新的探索方向和拓展领域。右脑掌控嗅觉，人们认为它还能够控制情感、记忆和创造力。香薰疗法——通过闻取精油和香水的香味来治疗身体不适合情感问题——帮助平衡激素和人体的能量。香薰疗法理论表明吸入或者局部涂抹精油可以帮助人们增强免疫系统功能。闻一些甜美的气味也能够使人心情愉快，并且可以作为一种心理疗法。

就像研究香薰疗法一样，现在人们开始更多地着手于人体合成气味的研究——所谓体香，就是我们身体散发出来的，能够吸引他人或者使他人远离自身的体味。人类和其他动物一样，会释放一些信息素来吸引异性。人们正尝试制造一些新的香水来仿效信息素的效果，刺激异性脑部的性兴奋感觉器官。将来香水不仅能够帮助人们掩盖难闻的气味，还能够促进他们身心健康。

核心词汇

scent [sent] *n.* 使……充满香味
mask [mɑ:sk] *vt.* 掩饰
spice [spais] *n.* 药料，香料
resin ['rezin] *n.* 树脂
balsam ['bɔ:lsəm] *n.* 香油，香膏
secretion [si'kri:ʃən] *n.* 分泌，分泌物
petrochemicals [ˌpetrəu'kemikl] *n.* 石油化学制品，石油化学产品
castor ['kɑ:stə] *n.* 海狸香
musk [mʌsk] *n.* 麝香
fixative ['fiksətiv] *n.* 定色料，定香剂
dilute [dai'lju:t] *vt.* 冲淡，稀释
toilette [twɑ:'let] *n.* 化妆，打扮
perfumery [pə:'fju:məri] *n.* 香水制造业
jeopardy ['dʒepədi] *n.* 危险
outlaw ['autlɔ:] *vt.* 使……失去法律保护，将……逐出社会
heal [hi:l] *vt.* 治愈，使……复原
hormonal [hɔ:'məunəl] *adj.* 荷尔蒙的，激素的
bolster ['bəulstə] *vt.* 支持，增强
psychotherapy ['saikəu'θerəpi] *n.* 心理疗法，精神疗法
repel [ri'pel] *vt.* 逐退
arousal [ə'rauzəl] *n.* 激励，唤起

Seeing in the Dark

45. 黑暗中的视觉

机经选粹

这一篇是讲蝙蝠超声波的。先讲蝙蝠怎么在夜间捕捉食物，为什么要在夜间捕捉，然后讲夜间活动时怎么看清楚。再讲到发光的问题，列举了一些动物以及其特点。接着又讲到盲人，说他们有一种特殊的感觉，不是接触而是耳朵发出来的声波。最后说到声波技术的军事运用，尤其在二战期间。最后说明人类使用的声波和蝙蝠使用的不是同一种东西，一个科学家把它们通称为回声定位。

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Seeing in the Dark

Bat echolocation continues to amaze scientists with its sophistication and complexity.

Bats perform at night many of the activities necessary for their survival, sometimes accomplishing the feat in total darkness. Without using their vision, many bats can find food and avoid obstacles with great ease. Man has long marvelled at this ability, but it remained a mystery until only recently.

Lazarro Spallanzani, an Italian scientist in the late 1700s, provided the first insights on how bats operated in the dark. He put a bat and an owl in a semi-dark room and found that both could orient well in low light. The bat also flew effortlessly in complete darkness, but the owl bumped into objects in its flight path. When he placed a sack over the bat's head, it, too, became disoriented. Spallanzani concluded that bats used a "sixth sense" to orient, but he was not satisfied that he had the answer. He shared his results with other scientists and encouraged them to conduct experiments of their own to solve the problem.

Charles Jurine, a Swiss zoologist, added significant information by showing that blocking one of the bat's ears also prevented it from orienting. Spallanzani then devised new experiments, later concluding that bats could "see" with their ears, perhaps using

sound. The idea seemed preposterous and was rejected by most of his colleagues. Spallanzani's conclusion remained an interesting, but untestable, hypothesis.

It was not until 150 years later, in the 1930s, that Donald R. Griffin, then an undergraduate at Harvard University, went to work on Spallanzani's "bat problem". Using special microphones, Griffin showed that bats produce sounds above the human range of hearing. His discovery revealed that they use the echoes of these ultrasonic, high frequency calls to locate objects. He coined the term "echolocation" to describe this behavior, referring to the ability of bats to orient themselves by using the echoes of sounds they produce. Echolocation, the sonar "sight" of bats, is analogous to the sonar used by the military. Because it is produced by living organisms rather than by machines, it is often called "biosonar".

Although we most often associate echolocation with bats, other animals have also developed this sense. Toothed whales, porpoises, some species of shrews and tenrecs, oilbirds, and several species of swiftlets all use echolocation. It is also sometimes attributed to seals, rats, and humans, but the evidence for this is not conclusive.

Contrary to popular belief, not all bats can echolocate, nor, as we shall see, do they all use the same approach to echolocation. The order to which bats belong, the Chiroptera, consists of two suborders, the Microchiroptera and the Megachiroptera. Microchiropterans typically are small insectivorous bats, are found worldwide, and have well-developed echolocation abilities. Nearly 70% of the world's bat species fall into this group.

Megachiropteran bats are found only in the Old World tropics, are usually large-bodied, and feed on fruit, nectar, and pollen. They rely mainly on vision and olfaction to find food and are often referred to as flying foxes because many have dog-like faces. Most do not echolocate, although Egyptian fruit bats *(Rousettus aegyptiacus)* use echolocation to find their way in the caves where they roost.

The elaborate facial ornamentations of some microchiropteran bats are thought to be associated with echolocation, but a direct relationship between the two is not always clear. Bat facial structures show enormous variation, ranging from small triangular shaped noseleaves, to spear-shapes, to convoluted labyrinths of folds and wrinkles. They abound in most of the Old World and New World leaf-nosed bats, horseshoe bats, and false vampire bats, but are absent in most north temperate bats—the species with which most of us are familiar. Research with the short-tailed fruit bat *(Carollia perspicillata)*, a tropical New World species, reveals that the position and shape of its noseleaf affects the pattern of sound radiation from the bat.

Not all vocalizations produced by bats are echolocation calls. The squeaks and squawks that bats make in their roosts do not fall into this category, nor do the calls

that mother and young make to one another, or those that feeding bats make to defend their foraging territories. To echolocate, a bat must produce a particular type of sound and be able to hear and use the echoes that rebound from objects in its path.

An echolocating bat registers each outgoing sound pulse and compares the originals to returning echoes. The time lapsed between generating the outgoing sound and receiving an incoming echo provides an accurate assessment of a target's distance from the bat. Changes in the amplitude (intensity) and frequency (pitch) of the outgoing sound provide data about the nature of the target (e.g., size, shape, surface structure, velocity, etc.).

All microchiropteran bats produce echolocation calls using vocal cords in their voice boxes, or larynges. In contrast, echolocating Egyptian fruit bats make echolocation sounds by clicking their tongues. Different species broadcast calls in different ways, some emitting calls from the mouth and others through their nostrils. Oral emitters fly with their mouths open, and nasal emitters fly with their mouths closed. Remarkably, both kinds of bats can chew food and vocalize at the same time.

Incoming sounds, including echoes, are collected by the bat's external ears, or pinnae, before they are funnelled into the rest of a bat's hearing system. The great variation in bat ear design reflects differences in sound-collecting ability and the requirements of different species, and this in turn reveals something about the diversity of bat echolocation strategies.

Processing information from returning echoes involves an overwhelming array of complex operations in a bat's brain. In this respect, bats are biotechnical marvels, and not surprisingly, the subject of considerable study by biologists, medical doctors, the U.S. military, and others interested in the study of how animals hear. The military alone spends hundreds of thousands of dollars each year to study echolocation in bats and marine mammals.

The echolocation calls of bats can be classified in several ways. Although the calls of most are not audible to the human ear, the loudness of bat echolocation calls can still be measured. This is expressed in decibels (dB), and for comparison is usually measured at a fixed distance from a bat's mouth (at 10 centimeters or about four inches). Intense echolocation calls measure 110 dB or more (equivalent in strength to a smoke detector alarm). Faint echolocation calls measure as little as 60 dB (the intensity level of a normal human conversation).

Little brown bats (Myotis lucifugus) and big brown bats (Eptesicus fuscus) are examples of high intensity, or "shouting," echolocators, while northern long-eared bats (Myotis septentrionalis) or common vampires (Desmodus rotundus) are examples of low intensity, or "whispering" bats. In many cases, call intensity is related

to foraging habitat. Bats that feed in open spaces produce the most intense calls. In contrast, those that forage in cluttered areas, such as deep in a forest, usually produce lower intensity calls.

If some bats produce sounds equivalent in strength to a smoke alarm, why then can we not hear bat echolocation? The answer lies in the frequency or pitch at which the calls are produced. Frequency is measured in kilohertz (kHz). Humans hear sounds ranging up to 20 kHz, while most bats use a broader range (from about 9 kHz to 200+ kHz). Most bat echolocation calls are high in frequency, well beyond the range of human hearing, but we can hear the echolocation calls of some species. Spotted bats (Euderma maculatum), for example, produce calls that cover frequencies from 9 kHz to 15 kHz. Like the calls of many free-tailed (Tadarida spp.) and sheath-tailed bats (e.g. Old World Taphozous spp.), they are clearly audible to us.

Most echolocating bats do not produce calls at a constant frequency (CF). Calls usually start at one frequency and sweep down to another (frequency modulated, or FM, calls). In some cases, bat calls have both a CF and an FM component. The FM portion of a call provides a bat with information about the texture of an insect target and its position in horizontal and vertical space, while the CF component relays information about the insect's velocity. Harmonics or overtones, which are multiples of the sound frequencies used by the bat, further assist in pinpointing the insect's location.

Calls that span many frequencies are called broadband and are typical of the many microchiropterans that hunt flying insects in uncluttered open spaces. Narrowband calls, as the name implies, cover a narrower frequency range, focusing a lot of energy within a small range of frequencies. According to engineers studying call design, echoes from broadband signals provide an echolocator with the most detailed information about its target.

These different types of echolocation calls provide bats with different information. Low frequency, narrowband calls increase a bat's detection range, but because lower frequencies have longer wavelengths, they provide less detail about a target. The advantage is that they increase the echolocation signal's effective range. To obtain complete information about a target's distance and about the target itself, bats often switch from narrowband to broadband signals as they detect and close in on their prey.

Flexibility in call design is directly related to flexibility in hunting behavior. Bats that prey on airborne insects in open areas face a relatively straight-forward problem. They must find, follow, and evaluate hard targets moving against a soft background (the air). In contrast, species that hunt prey near or on vegetation have a more complex acoustical environment to cope with. Surface-gleaning bats therefore use different echolocation call types than bats that take insects from the air. The calls of

gleaners are shorter, more broadband, and lower in intensity than those of bats that hunt airborne prey. Some bats combine both foraging tactics, but others are more limited in their flexibility and therefore are more restricted in their hunting repertoires.

Echolocation allows bats to evaluate targets with precision. Despite this, it has serious drawbacks for animals that operate in the air. Air absorbs, or attenuates, the energy contained in sound waves. High frequency sounds have relatively short wavelengths and are much more vulnerable to atmospheric attenuation than are those of low frequency, which have long wavelengths. The booming bass of a stereo illustrates how low-frequency sound can carry for considerable distance (much more so, for example, than the high frequency sound of a flute).

Atmospheric absorption reduces the operational range of echolocation in air and appears to limit its effectiveness to a maximum of about 50 feet. Only the few bat species that emit very low frequency echolocation calls are able to reach even this distance. Laboratory studies with big brown bats (covering frequencies of 60~30 kHz), have shown that these animals are quite "near-sighted," first detecting a 3/4-inch sphere at about 16 feet.

The length of each echolocation call, and the rate at which they are produced, changes according to the situation. Calls can be relatively long, up to 50 milliseconds (ms, or thousandths of a second), or very short (less than one ms long). A bat searching for an insect typically produces longer calls than one going in for a kill. For example, when a red bat (Lasiurus borealis) is looking for insects (the search phase), it produces calls 8~12 ms long, averaging about 10 calls per second. As it zeroes in on a target (the approach phase), it shortens the length of its calls as well as the interval between them. In the terminal phase of an attack, right before a bat makes its kill, calls are only one or two ms long and are produced in a rapid volley of about 200 per second. Electronic devices called bat detectors allow the human ear to perceive these various components of a bat's echolocation bouts (see "Tuning in with a bat detector," page 15).

When a long, narrowband echolocation call strikes the body of an insect that is beating its wings, the returning echoes reflect a rhythmic, but constant, pattern. When the insect's wings are at the top or bottom of a wingstroke, for example, they reflect sound from a larger surface than when they are in a horizontal position. The ability to distinguish the flutter patterns of flying insects is well developed in bats using constant frequency echolocation calls. Included in this group are horseshoe bats (Rhinolophus spp.), Old World leaf-nosed bats (Hipposideros spp.), and Parnell's mustached bat (Pteronotus parnelli). There are about 120 species of Rhinolophus and Hipposideros, which live only in the Old World. In the New World, Parnell's moustached bat is unique in using this CF approach to echolocation.

Structures within the ears of these bats, and accompanying concentrations of nerve cells, tune their auditory systems to very narrow and specific frequencies. Although they can hear many other frequencies, this specialization gives them great powers of resolution at the frequencies with which they hunt.

For bats calling at a constant frequency, the Doppler effect (a phenomenon produced as objects move toward or away from each other) provides a significant potential source for error. The auditory specializations of Rhinolophus, Hipposideros, and Pteronotus allow them to actually exploit the Doppler-shifted echoes from their fluttering targets, giving them an excellent way to find flying insects.

The most thoroughly studied echolocating bats are those preying on flying insects. But bats that hunt non-flying animal prey use echolocation for more than just locating or assessing potential food items. Central America's frog-eating bat (Trachops cirrhosus) is one species that does this. Merlin Tuttle and Michael Ryan demonstrated that these bats use frog calls to find and identify their prey whether the frog is sitting in water or on land.

Frog-eating bats produce echolocation calls when they approach their target, yet they can be fooled into attacking a speaker playing frog calls. Surely if the bat were using echolocation to collect information about its target, it would not make such a mistake. Biologists presume that frog-eating bats, like many other species, use echolocation to find out about the surrounding background, rather than to locate and assess their targets.

So echolocation is invaluable in pinpointing a potential meal or gaining information about the surrounding landscape. But it also has its drawbacks. The high intensity of echolocation calls and the large number of calls produced advertise a bat's presence, making them conspicuous to potential prey. It is not surprising, therefore, to find that many insects have ears that are sensitive to bat echolocation calls. This anti-bat system provides early warning of an approaching peril [see "Predator and Prey: Life and Death Struggles," page 5].

As a countermeasure, bats, such as pallid bats (Antrozous pallidus), California leaf-nosed bats (Macrotus californicus), and Indian false vampire bats (Megaderma lyra), use foraging strategies that avoid echolocation call production when other sources of information are available. Macrotus and Megaderma, for example, have excellent vision and can use this to locate and identify their targets whenever there is enough light.

This is a small sampling of what we have learned about the echolocation abilities of bats since Spallanzani began to unravel the mystery of how bats are able to "see" with their ears. The more we learn about these animals, the more they continue to amaze and intrigue us with the many and varied ways in which they accomplish their remarkable sensory feats. We have come a long way, but there is still much to learn before we completely understand the phenomenon of echolocation.



蝙蝠的回声定位能力继续以其精密性和复杂性使科学家们大为惊奇。

蝙蝠为了生存所必需的许多活动都是在夜间进行的，有时这些活动是在漆黑一片中完成的。许多蝙蝠在不使用视觉能力的情况下，可以很轻松地寻找到食物和躲避障碍物。在很长的一段时间内，人类都惊讶于这种能力，但直到最近这种能力仍然是一个谜。

18世纪后期的意大利科学家拉扎罗·斯帕兰扎尼，首次就蝙蝠如何在黑暗中行动进行了深入的观察。他把一只蝙蝠和一只猫头鹰放在一个半黑的房间里，然后发现二者都可以在微弱的光线下准确定位。而且蝙蝠还可以毫不费力地在漆黑中飞行，但猫头鹰却在飞行途中撞上了障碍物。当他把一个袋子套在蝙蝠的头部时，它也迷失了方向。斯帕兰扎尼推断蝙蝠使用“第六感”来确定方位，但他对自己的这个答案并不满意。他把自己的研究结果告诉其他的科学家进行探讨，并鼓励他们进行试验来解决这个问题。

瑞士动物学家查尔斯·朱尼为此前的研究补充了重要信息，他表示如果塞住蝙蝠的一只耳朵也会妨碍其辨别方向。然后，斯帕兰扎尼设计了新的实验，后来推断蝙蝠能用他们的耳朵“看”东西，也许就是利用声音来“看”的。这个结论似乎很荒谬，并遭到了他大部分同行的否决。斯帕兰扎尼的结论仍然是一种有趣但无法检验的假说。

直到150年后的20世纪30年代，哈佛大学的一名本科生唐纳德·R.格里芬，开始继续研究斯帕兰扎尼的“蝙蝠问题”。格里芬使用特殊的麦克风，表明蝙蝠发出的声波频率超出人耳的听觉范围。他的发现显示它们可以发出高频率的叫声即超声波，并利用反射回来的声波来定位目标。他创造了新术语“回声定位法”来描述这种现象，这指的是蝙蝠通过使用它们发出的声音的回音来确定方位的能力。回声定位即蝙蝠的声波定位“视觉”，与军事中使用的声波定位类似。因为它是由活的生物体而不是由机器产生的，所以通常被称作“生物声波定位”。

虽然我们常常把回声定位与蝙蝠联系起来，但其他动物也有这种感官能力。齿鲸、海豚、一些地鼠品种、大怪鸱、马岛猬等某些物种以及金丝燕的几个物种都使用回声定位法。虽然海豹、大鼠和人类有时也具备这种能力，但对这一点我们并没有确凿的证据。

与大众看法完全不同的是，不是所有的蝙蝠都可以凭回声定位，或者，就像我们将看到的那样，它们都使用相同的回声定位法。蝙蝠所属的目——翼手目，由两个亚目组成——小蝙蝠亚目和大蝙蝠亚目。小蝙蝠亚目通常是小型食虫蝙蝠，在全世界都可以找到，它们具有很发达的回声定位能力。世界上近70%的蝙蝠都属于这个类别。

大蝙蝠亚目属蝙蝠只有在旧世界(即欧、亚、非、澳洲，尤指欧洲)热带地区才能找到。它们通常体型巨大，以果实、花蜜和花粉为食。它们主要依靠视觉和嗅觉寻找食物，并且由于它们中有很多面部像犬，因而常常被称作飞狐。虽然埃及果蝠使用回声定位寻找它们栖息地洞穴的道路，但大多数大蝙蝠亚目属蝙蝠都不能回声定位。

一些小蝙蝠亚目属蝙蝠复杂的面部结构被认为与回声定位能力有关，但二者的直接联系并不甚明确。蝙蝠的面部结构千变万化，从小三角形的鼻叶到矛状的鼻叶，再到错综复杂的褶皱和皱纹。这些大量存在于旧世界及新世界(指西半球或南、北美洲及其附近岛屿)的大多数叶鼻蝠、菊头蝠蝙蝠以及假吸血蝠之中，并不存在于最北温带蝙蝠之中——我们大多数人所熟悉的物种。对短期尾果蝠——一种热带新世界物种的研究显示，它鼻叶的位置和形状会影响蝙蝠的声辐射模式。

并非蝙蝠发出的所有声音都是用于回声定位的。蝙蝠在它们的栖息处发出的短促尖利

和刺耳的叫声，母蝙蝠和小蝙蝠对彼此发出的呼唤声，或是那些进食的蝙蝠捍卫它们觅食的领土时发出的叫声，都不属于这一类。蝙蝠必须发出一种特殊类型的声音，而且要能听到和运用从传播途中的物体上反弹回来的回声，才可以算回声定位。

蝙蝠运用回声定位时会记录发出的每一个脉冲声，并把原音与返回的回音进行比较。蝙蝠根据产生输出声和接收到传入的回声之间相隔的时间，可以准确地估计目标与自己之间的距离。根据发出声音的振幅(强度)和频率(音高)的变化可以了解目标的特性(例如大小、形状、表面结构、速度等)。

所有小蝙蝠亚目属蝙蝠都是利用它们喉头或者喉部的声带发出的声音信号来回声定位的。相比之下，埃及果蝠是通过弹舌头来发出这种回声定位叫声的。不同种类的蝙蝠以不同的方式发出叫声，有些从嘴里发出，而其他的则通过它们的鼻孔发出。用嘴发声的蝙蝠张着嘴飞行，用鼻发声的蝙蝠闭着嘴飞行。值得注意的是，这两种蝙蝠都可以边咀嚼食物边发声。

在传入蝙蝠的其他听觉系统之前，传入的声音(包括回声)都由蝙蝠的外耳或耳郭采集起来。蝙蝠耳朵样式的巨大变化反映了声音采集能力的差异和不同物种需要的差异，而这又揭示了蝙蝠回声定位策略的多样性。

处理从返回的回音中获取的信息涉及蝙蝠大脑里大量的复杂运作。在这方面，蝙蝠是生物技术上的一大奇迹。因此，生物学家、医生、美国军队及其他对动物如何听东西的研究有兴趣的人都对蝙蝠进行了大量研究，这也毫不为奇。仅军队，每年就花费几十万美元研究蝙蝠和海洋哺乳动物的回声定位能力。

蝙蝠的回声定位叫声可用几种方式来进行区分。虽然绝大多数叫声人耳是听不到的，但蝙蝠用以回声定位的叫声的音量仍然是可以检测到的。这可以用分贝(dB)表示，为了方便比较，音量通常是在一个离蝙蝠嘴的距离(10厘米或约4英寸)固定的地方测量的。强烈的回声定位叫声有110分贝或更高(相当于一个烟雾探测器报警的音量)。微弱的回声定位叫声只有60分贝(正常人类说话的强度)。

核心词汇

vision ['viʒən] *n.* 视觉，视力
obstacle ['ɔbstəkl] *n.* 障碍
marvel ['mɑːvəl] *vi.* 惊异于，感到惊讶
orient ['ɔːriənt] *vt.* 确定方位
bump [bʌmp] *vi.* 碰撞，颠簸而行
disoriented [dis'ɔːrientid] *adj.* 分不清方向的，迷失方向的
preposterous [pri'pɔstərəs] *adj.* 荒谬的，可笑的
echo ['ekəu] *n.* 回声，回音
ultrasonic [ˌʌltrə'sɔnik] *n.* 超声波
echolocation [ekəuləu'keiʃ(ə)n] *n.* 回声定位法
analogous [ə'næləgəs] *adj.* 类似的
porpoise ['pɔːpəs] *n.* 海豚
tenrec ['tenrek] *n.* 马岛猬
insectivorous [ˌinsek'tivərəs] *adj.* 以虫类为食物的，食虫的
roost [ruːst] *vi.* 栖息，安歇
ornamentation [ˌɔːnəmen'teiʃən] *n.* 装饰品，装饰
convoluted ['kɔnvəljuːtid] *adj.* 复杂的，费解的
vampire ['væmpaiə] *n.* 吸血鬼
squawk [skwɔːk] *n.* 大的叫声，尖叫
pulse [pʌls] *n.* 脉冲
lapse [læps] *vi.* 流逝，消逝
amplitude ['æmplitjuːd] *n.* 振幅
nostril ['nɔstril] *n.* 鼻孔
vocalize ['vəukəlaiz] *v.* 发声
overwhelming [ˌəuvə'hwelmiŋ] *adj.* 势不可挡的，压倒的

Lots of Animals Learn, but Smarter Isn't Better

46. 动物学习：聪明反被聪明误

机经选粹

这一篇是讲动物行为的学习能力。动物不像人类一样有智慧，对许多动物做了大量的实验，但不同级别的动物有不同的思考方式。讲到了思考的定义，并提到思考只属于人类。后来科学把实验动物的大脑去掉，看看有什么影响。



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Lots of Animals Learn, but Smarter Isn't Better

"Why are humans so smart?" is a question that fascinates scientists. Tadeusz Kawecki, an evolutionary biologist at the University of Fribourg, likes to turn around the question.

"If it's so great to be smart," Dr. Kawecki asks, "why have most animals remained dumb?"

Dr. Kawecki and like-minded scientists are trying to figure out why animals learn and why some have evolved to be better at learning than others. One reason for the difference, their research finds, is that being smart can be bad for an animal's health.

Learning is remarkably widespread in the animal kingdom. Even the microscopic vinegar worm, Caenorhadits elegans, can learn, despite having just 302 neurons. It feeds on bacteria. But if it eats a disease causing strain, it can become sick.

The worms are not born with an innate aversion to the dangerous bacteria. They need time to learn to tell the difference and avoid becoming sick.

Many insects are also good at learning. "People thought insects were little robots doing everything by instinct," said Reuven

Dukas, a biologist at McMaster University.

Research by Dr. Dukas and others has shown that insects deserve more respect. Dr. Dukas has found that the larvae of one of the all-time favorite lab animals, the fruit fly, Drosophila melanogaster, could learn to associate certain odors with food and other odors with predators.

In another set of experiments, Dr. Dukas discovered that young male flies wasted a lot of time trying to court unreceptive females. It takes time to learn the signs of a receptive fly.

Dr. Dukas hypothesizes that any animal with a nervous system can learn. Even in cases where scientists have failed to document learning in a species, he thinks they should not be too quick to rule it out. "Is it because I'm not a good teacher or because the animal doesn't learn?" Dr. Dukas asked.

Although learning may be widespread among animals, Dr. Dukas wonders why they bothered to evolve it in the first place. "You cannot just say that learning is an adaptation to a changing environment," he said.

It is possible to adapt to a changing environment without using a nervous system to learn. Bacteria can alter behavior to help their survival. If a microbe senses a toxin, it can swim away. If it senses a new food, it can switch genes on and off to alter its metabolism.

"A genetic network like the one in E. coli is amazingly good in changing environments," Dr. Dukas said.

Learning also turns out to have dangerous side effects that make its evolution even more puzzling. Dr. Kawecki and his colleagues have produced striking evidence for these side effects by studying flies as they evolve into better learners in the lab.

To produce smarter flies, the researchers present the insects with a choice of orange or pineapple jelly to eat. Both smell delicious to the insect. But the flies that land on the orange jelly discover that it is spiked with bitter-tasting quinine. The flies have three hours to learn that the nice odor of oranges is followed by a nasty taste.

To test the flies, the scientists then present them with two plates of jelly, one orange and one pineapple. This time, neither has quinine. The flies settle on both plates of jelly, feed, and the females lay their eggs.

"The flies that remember they had a bad experience with orange should continue to avoid orange and go to the pineapple," Dr. Kawecki said.

Dr. Kawecki and his colleagues collect the eggs from the quinine-free pineapple jelly and use them to produce the next generation of flies. The scientists repeat the procedure on the new flies, except that the pineapple jelly is spiked with quinine instead of the orange.

It takes just 15 generations under these conditions for the flies to become genetically programmed to learn better. At the beginning of the experiment, the flies take many hours to learn the difference between the normal and quinine-spiked

jellies. The fast-learning strain of flies needs less than an hour.

But the flies pay a price for fast learning. Dr. Kawecki and his colleagues pitted smart fly larvae against a different strain of flies, mixing the insects and giving them a meager supply of yeast to see who would survive. The scientists then ran the same experiment, but with the ordinary relatives of the smart flies competing against the new strain. About half the smart flies survived; 80 percent of the ordinary flies did.

Reversing the experiment showed that being smart does not ensure survival. "We took some population of flies and kept them over 30 generations on really poor food so they adapted so they could develop better on it," Dr. Kawecki said. "And then we asked what happened to the learning ability. It went down."

The ability to learn does not just harm the flies in their youth, though. In a paper to be published in the journal *Evolution*, Dr. Kawecki and his colleagues report that their fast-learning flies live on average 15 percent shorter lives than flies that had not experienced selection on the quinine-spiked jelly. Flies that have undergone selection for long life were up to 40 percent worse at learning than ordinary flies.

"We don't know what the mechanism of this is," Dr. Kawecki said.

One clue comes from another experiment, in which he and his colleagues found that the very act of learning takes a toll. The scientists trained some fast-learning flies to associate an odor with powerful vibrations. "These flies died about 20 percent faster than flies with the same genes, but which were not forced to learn," he said.

Forming neuron connections may cause harmful side effects. It is also possible that genes that allow learning to develop faster and last longer may cause other changes.

"We use computers with memory that's almost free, but biological information is costly," Dr. Dukas said. He added that the costs Dr. Kawecki documented were not smart animals' only penalties. "It means you start out in life being inexperienced," Dr. Dukas said.

When birds leave the nest, they need time to learn to find food and avoid predators. As a result, they are more likely to starve or be killed.

Dr. Dukas argues that learning evolves to higher levels only when it is a better way to respond to the environment than relying on automatic responses.

"It's good when you want to rely on information that's unique to a time and place," Dr. Dukas said. Some bee species, for example, feed on a single flower species. They can find plenty of nectar using automatic cues. Other bees are adapted to many different flowers, each with a different shape and a different flowering time. Learning may be a better strategy in such cases.

Scientists have carried out few studies to test this idea. One study, published this year by scientists at the University of London, showed that fast-learning colonies

of bumblebees collected up to 40 percent more nectar than slower colonies.

Dr. Kawecki suspects that each species evolves until it reaches an equilibrium between the costs and benefits of learning. His experiments demonstrate that flies have the genetic potential to become significantly smarter in the wild. But only under his lab conditions does evolution actually move in that direction. In nature, any improvement in learning would cost too much.

Dr. Kawecki and Dr. Dukas agree that scientists need to pinpoint the tradeoffs, and they will have to gauge the role of learning in the lives of many species. As their own knowledge increases, they will understand more about humans' gift for learning.

"Humans have gone to the extreme," said Dr. Dukas, both in the ability of our species to learn and in the cost for that ability.

Humans' oversize brains require 20 percent of all the calories burned at rest. A newborn's brain is so big that it can create serious risks for mother and child at birth. Yet newborns know so little that they are entirely helpless. It takes many years for humans to learn enough to live on their own.

Dr. Kawecki says it is worth investigating whether humans also pay hidden costs for extreme learning. "We could speculate that some diseases are a byproduct of intelligence," he said.

The benefits of learning must have been enormous for evolution to have overcome those costs, Dr. Kawecki argues. For many animals, learning mainly offers a benefit in finding food or a mate. But humans also live in complex societies where learning has benefits, as well.

"If you're using your intelligence to outsmart your group, then there's an arms race," Dr. Kawecki said. "So there's no absolute optimal level. You just have to be smarter than the others."

参考译文

卡维茨博士和一些志同道合的科学家们正在试图阐明，动物为何学习，以及为何在学习方面一些动物比另一些动物进化得更好。他们的研究发现，产生差异的原因之一是聪明可能对动物的健康不利。

学习现象在动物界非常普遍。甚至用显微镜才能观察到的只有302个神经细胞的醋线虫(秀丽线虫)也能学习。它以细菌为食，但是如果它吃到致病的细菌，就可能会生病。

虫子们不是天生就有排斥危险细菌的能力。它们需要时间学习辨别致病病菌，以避免生病。

很多昆虫也擅长学习。加拿大麦克马斯特大学生物学家鲁文·杜卡斯说：“以前，人们认为昆虫就是凭本能行动的小机器人。”

杜卡斯博士和其他科学家的研究表明，昆虫应该获得更多关注。杜卡斯博士

发现，科学家们一直青睐有加的实验室动物之一——果蝇——的幼虫，能通过学习将气味与食物以及气味与天敌联系起来。

尽管在动物中学习的现象可能普遍存在，但杜卡斯博士想知道为何动物们不是在一开始就进化得有学习能力。他说："你不能只是说学习是对变化着的环境的适应。"

动物不利用神经系统学习，也有可能适应变化的环境。细菌能通过改变行为来帮助生存，如果一个细菌感觉到一种毒素，它就会游离开；如果感觉到一种新的食物，它就会重组基因来改变新陈代谢。

杜卡斯博士说："像大肠杆菌里的基因网络，其适应环境变化的能力相当强。"

学习也有危险的副作用，它使动物进化更加扑朔迷离。卡维茨博士和他的同事们通过研究实验室里进化成一些具有更强学习能力的果蝇，已经发现了副作用存在的惊人证据。

为了培养更聪明的果蝇，研究人员提供给果蝇选择橘子冻或者菠萝冻的机会。对它们来说这两种食物都很美味，但是停在橘子冻上的果蝇发现里面有苦味的奎宁，它们花了3个小时了解到这种好闻的橘子里有苦味。

为了测试果蝇，科学家们又给它们两盘果冻，分别是橘子冻和菠萝冻。这一次，两种果冻里都没有奎宁。果蝇们飞落在这两个果冻盘上，吸食美味，雌蝇还在上面产了卵。

在这些情形下，繁衍出的果蝇到第15代就形成了拥有更好学习能力的基因编程。实验之初，果蝇们要花上好几个小时去弄清正常的和有奎宁的果冻之间的区别。而学习能力强的果蝇只需要不到1小时的时间。

但是，果蝇们为学习能力的加快付出了代价。卡维茨博士和他的同事们把聪明的果蝇幼虫挑出来和另一种果蝇混合在一起，给它们提供分量不足的酵母菌，以此来看看谁能存活下来。然后科学家用与新果蝇竞争的聪明果蝇的普通亲戚来做同样的实验。聪明果蝇约有一半存活，而普通果蝇则存活了80%。

逆向实验表明，聪明并不能保证生存。卡维茨博士说："我们选了一些果蝇，一直用不足的食物培养了30多代，所以它们适应了，因此成长得更好。然后我们所做的就是看看它们学习能力到底有何变化。结果是，它们的学习能力下降了。"

然而，学习的能力不只对年轻的果蝇有害。卡维茨博士和他的同事们在一篇即将发表在《进化》期刊里的论文中描述，学习能力强的果蝇的平均寿命比尚未经过奎宁果冻选择的果蝇短15%。而经过长寿挑选的果蝇的学习能力比一般果蝇差40%。

在另一个实验中，他和同事们发现一条线索：正是动物的学习行为使它们付出了代价。科学家们训练一些学得快的果蝇将气味和有力的振动联系起来。他说："这些果蝇的死亡速度，比有着同样基因但没被迫学习的果蝇快大约20%。"

神经元连接的形成可能会引起有害的副作用。经学习，超速发展、存活时间更长的基因也有可能产生其他变化。

杜卡斯博士说道："我们使用的有内存的计算机几乎是免费的，然而，生物信息的提取和保存则昂贵得多。"他补充道，卡维茨博士证实的成本并不是对聪明动物唯一的"罚款"，并说道："它意味着你是在经验不足时开始了生命的航程。"

当鸟儿离开巢穴时，它们需要时间学习觅食，躲避天敌。因此，它们就更可能饿死或被捕杀。

杜卡斯博士认为，当动物们不依赖自身的本能反应，而是更好地应对环境变化的时候，学习才进化到更高层次。

他说："依赖于针对某一个时间某一个地点的特有信息是可行的。"他举例说，依靠某种花卉为食的蜜蜂物种，利用其自身的本能提示，可以找到大量蜜源。而其他蜜蜂学会适应不同种类的花，不同的花形，不同的花期。在这种情况下，学习可能是更好的策略。

科学家们还没有开展研究来检测这一观点。今年，伦敦大学的科学家们发表了一项研究表明：学得快的大黄蜂比学得慢的黄蜂采集的花蜜多40%。

卡维茨博士怀疑：每个物种在学习中直到付出和收益之间达到某种平衡，它们就会进化。他的一系列实验证明，在野外，果蝇有使其变得极为聪明的遗传潜力。然而，实际上，只有在实验室条件下，进化才朝向那个方向发展。本质上说，学习过程中，取得任何进展都需要付出更多。

卡维茨博士表示，学习对进化一定有好处并能助其克服付出的代价。对许多动物来说，学习主要是助其在觅食或求偶上成功。但是，学习对生活在复杂社会环境下的人类同样大有裨益。

核心词汇

smart [smɑ:t] *adj.* 聪明的
vinegar ['vinigə] *n.* 醋
aversion [ə'və:ʃən] *n.* 嫌恶，憎恨
instinct ['instiŋkt] *n.* 本能，天性，直觉
switch [switʃ] *vt.* 转变，切换
puzzling ['pʌzliŋ] *adj.* 令人迷惑的，茫然不知所措的
striking ['straikiŋ] *adj.* 引人注目的，显著的
pineapple ['painæpl] *n.* 菠萝
quinine [kwi'ni:n] *n.* 奎宁
nasty ['næsti] *n.* 令人作呕的，下流的
meager ['mi:gə(r)] *adj.* 贫乏的，不足的
ensure [in'ʃuə] *vt.* 确定，保证
ordinary ['ɔ:dinəri] *adj.* 普通的，平凡的
neuron ['njuərɔn] *n.* 神经元，神经细胞
penalty ['penəlti] *n.* 处罚，惩罚
automatic [,ɔ:tə'mætik] *adj.* 自动的，无意识的
nectar ['nektə] *n.* 花蜜，甜美的饮料
equilibrium [,i:kwi'libriəm] *n.* 平衡，均衡

Nature's Gifts

47. 大自然的馈赠



这一篇是关于澳大利亚更新能源的问题。

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Nature's Gifts

Australia needs an estimated A$37 billion to invest in new energy supply infrastructure by 2020. As governments open energy markets and provide the framework to support this investment, researchers and industry are rising to the challenge with a variety of innovative renewable energy supply solutions.

In the current social and political environment, few issues loom as large as the future of the world's energy supplies. For reasons both environmental and economical, the traditional sources of energy will inevitably need to be supplemented with new and innovative solutions.

In this context, Australia enjoys a proud reputation for cutting-edge research and development (R&D), a skilled and experienced workforce, a politically stable environment and enviable natural resources. The country's scientific expertise and competitive costs provide a valuable opportunity for investors to design, manufacture, install and export renewable energy products.

The contribution of renewable energy to Australia's electricity generation is projected to increase from 67 petajoules (PJ) in 2004—2005 to 100PJ in 2019—2020.

A Bright Future

Solar radiation is Australia's largest potential energy source. Over 90% of Australia's land surface receives in excess of 1,950 kilowatt hours per square metre (kWh/m^2) per annum of sunshine.

There is a well-established advanced manufacturing sector for photovoltaic (PV) technologies. BP Solar is the largest solar panel manufacturer in the southern hemisphere. Additionally, energy company

Origin Energy has commercialised the Australian-developed 'sliver' cell technology, which uses considerably less silicon than conventional PV cells.

Australian companies Fluorosolar Systems Limited, New Energy Partners Redflow Energy Pty Ltd and Solar Systems Generation, to name a few, offer new technologies to tap this vast resource. In 2006, these companies attracted funding to commercialise flexible polymer 'day lighting' technology for buildings; low-cost and lightweight medium temperature solar concentrating collectors; novel zinc-bromine batteries; and triple junction PV cells in a large-scale solar concentrator.

Steady Breeze

There is considerable potential to take advantage of Australia's wind resources, which are among the strongest and most abundant on earth. From 2000—2005, wind energy was the fastest growing renewable energy industry in Australia, increasing generation capacity from 0.2PJ to 4.5PJ over the period. This growth is projected to continue at 6.4% a year until 2030.

Alongside large wind farm developments are innovative component and service companies, including Powercorp in the Northern Territory with its Intelligent Power Systems (IPS) energy storage system. The IPS can integrate renewable energy sources such as wind, solar and mini-hydro into isolated power supply systems. Energy penetration levels from wind trials have improved from anywhere between 20% to 70% using the system.

Growth of Australian wind energy has been driven by a combination of Australia's natural advantages and the support available through government programs, in particular the Australian Government's Mandatory Renewable Energy Target (MRET). MRET demands the installation of 9,500GWh of additional renewable energy generation by 2010, and for this level to be maintained until 2020. The measure is expected to stimulate investment of A$3 billion in renewable energy over the life of the scheme.

Abundant Bio-Energy

Australia has long promoted the use of biomass-plant, animal and waste materials—as a viable energy source. Its extensive sugarcane plantations are an abundant source of biomass. Australia's sugar industry estimates that bagasse (the residue of sugarcane crushing) can produce more than 4,000MW of electricity annually.

Australia's biofuels industry is entering a growth phase. Supporting longer-term sustainability of feedstock supply in Australia are CSR Sugar and Uniquest, Microbiogen Pty Ltd, Farmacule Bioindustries, Biomass Conversion Technologies and SQC Pty Ltd, among others. Ongoing research is advancing the production of hydrocarbons from algae, yeast varieties that improve ethanol yield from plant waste, use of lignocellulose for fuel ethanol production, and plant genetic engineering to produce valuable biological compounds for a range of applications.

Australia has excellent wave resources off its western and southern coasts that can be harnessed for energy generation as technologies develop.

BioPower Systems Pty Ltd is developing new systems for both wave and tidal energy conversion. Its technology mimics many of the beneficial traits of natural processes in the development of new ocean energy conversion systems. The company is undergoing proof-of-concept R&D throughout 2007, prior to full-scale prototype testing in 2008.

Australia also has large volumes of identified high heat producing granites within five kilometres of the surface. Several companies are exploring and testing the potential for hot dry rock geothermal energy in the Euromanga and Cooper basins. These sites are estimated to contain energy equivalent to the nation's electricity needs for 800 years.

The Hydrogen Economy

Australia is an active participant in the International Partnership for the Hydrogen Economy, a program aimed at developing codes and standards for the use of hydrogen and accelerating the development of hydrogen and fuel cell technologies.

The Australian Hydrogen Activity report, released in May 2005, identified more than 120 hydrogen energy research projects underway across the country, involving at least 36 different organisations. The report shows Australia is well placed to participate in international research and collaboration on hydrogen energy technology.

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) has established the National Hydrogen Materials Alliance to develop new materials for the generation and storage of hydrogen. CSIRO *research includes:*

* *the development of low-cost metal and iron transport membrane-based gas cleaning/hydrogen separation technologies;*

* *the production of a compact and all solid-state modular system for distributed hydrogen generation on demand;*

* *a system integrated with a sustainable energy source and aimed at achieving high electrolysis efficiency;*

* *the development and demonstration of a reactor at the National Solar Energy Centre (NSEC) that combines natural gas and solar energy to form solar gas, and ultimately solar hydrogen; and*

* *the development of expertise and comprehensive facilities for the fabrication, testing and evaluation of Polymer Electrolyte Membrane Fuel Cells up to several kilowatts in size.*

Government Backing

Renewable energy technology development and deployment in Australia is supported through: the provision of equity and venture capital funds; R&D tax concessions; technology demonstration and commercialisation funds; remote renewable power generation project incentives; energy market reforms; and international agreements.

In January 2006, Australia hosted the inaugural meeting of the Asia Pacific Partnership on Clean Development and Climate (AP6), involving Australia, the United States, Korea, China, India and

Japan. The partnership aims to facilitate collaboration in developing, deploying and transferring cleaner technologies and practices.

The Australian Government has committed A$25 million for the exclusive development of renewable energy technology under AP6. This funding increases Australia's investment in climate change to nearly A$2 billion and brings the Australian Government's commitment to low emissions technologies and renewable energy to over A$1.1 billion.

The Energy White Paper, announced in June 2004, includes the following measures to support renewable energy generation in Australia:

* *Low Emission Technology Demonstration Fund—A$500 million to leverage over A$1 billion in private investment to develop and demonstrate low emission technologies;*
* *Renewable Energy Development Initiative—A$100 million to target strategic development of renewable energy technologies, systems and processes that have a strong commercial potential; and*
* *Solar Cities—A$75 million to demonstrate the economic benefits of photovoltaics and how technology, energy efficiency and markets can combine to provide a sustainable future.*

Renewable energy is an important element of Australia's future energy needs. An expanding and innovative industry, abundance of natural resources, intensive R&D base with access to world-class infrastructure, a population increasingly embracing new technology, and substantial government support have all combined to ensure innovative companies have an arena in Australia to develop and showcase their technologies and solutions to the world.

参考译文

在目前这样的社会和政治环境下，再没有什么事情比世界能源供应的前景更迫在眉睫了。由于环境和经济上的各种原因，传统能源必然需要有新型能源供应来进行补充。

在这样的大环境中，澳大利亚因其尖端的研发技术、技能熟练经验丰富的劳动力、稳定的政治环境和丰富的自然资源而美名远扬。这个国家的专业技术和极具竞争力的低成本为投资者们设计、制造、安装和出口可再生能源产品提供了宝贵的机会。

预计可再生能源对澳大利亚发电事业的贡献从2004—2005年的67拍焦耳增加到2019—2020年的100拍焦耳(PJ)。

太阳能是澳大利亚最大的潜在能源。澳大利亚90%的土地一年所接收的太阳能超过了每平方米1,950千瓦时(kWh/m²)。

这里有着声名远扬的先进太阳能光伏发电技术(PV)设备制造业。英国石油公司太阳能分部是南半球最大的太阳能电池板制造商。另外，奥雷金能源公司已经成功商业化澳大利亚人自主研发的“长条薄

片”电池技术，这种“长条薄片”电池比传统的光伏电池要节省相当多的硅。

澳大利亚的能源公司如Fluorosolar Systems Limited、New Energy Partners Redflow Energy Pty Ltd和Solar Systems Generation为开发这种巨大能源提供新的技术。2006年，这些公司吸引资金用于商业化建筑物的柔性聚合物“采光”技术、低成本质轻中温聚光集热器、新型锌溴电池和用于大型太阳能聚光集热器的三结合点光伏电池等技术。

澳大利亚的风是世界上最强劲最充足的，所以开发澳大利亚的风能是很有潜力的。从2000—2005年，风能是澳大利亚发展速度最快的可再生资源，风能发电量从0.2拍焦耳增长到了4.5拍焦耳。截止到2030年，预计这个发电量会以每年6.4%的速度增长。

靠着大型风力发电开发区的是各种创新技术和服务公司，包括北领地配备有智能电力系统(IPS)蓄能系统的Powercorp公司。智能电力系统能够融合风能、太阳能和微型水能等可再生能源，使之成为一个独立的能源供应系统。使用该系统能够使风能注入水平提高20%~70%。

澳大利亚风能的发展受到澳大利亚自然优势的推动和政府计划的鼓励支持——特别是澳大利亚政府制定强制性可再生能源目标的大力推动。强制性可再生能源目标要求：2010年之前再多增加9.5亿千瓦时的再生能源发电量，到2020年，发电量继续保持这个水平增长。预计在该项目施行期内会吸引30亿澳元的资金投资可再生资源。

长久以来，澳大利亚一直鼓励使用生物能——植物、动物和废料——作为可行能源。这里广袤的甘蔗园为生物能提供了一个丰富的来源。据澳大利亚制糖业估计，甘蔗渣(甘蔗榨汁之后的残渣)每年能产生4,000兆瓦的电能。

澳大利亚的生物燃料工业正进入一个成长阶段。有许多公司如CSR Sugar and Uniquest、Microbiogen Pty Ltd、Farmacule Bioindustries、Biomass Conversion Technologies和SQC Pty Ltd都在努力确保澳大利亚给料供应的长期可持续性。一些正在进行的研究旨在提高藻类生产碳氢化合物的产量、研发能够提高植物废弃物酒精产量的不同发酵剂、研发利用木质纤维素生产燃料酒精的技术和推进基因工程发展，以研发出更多有价值供实际运用的生物化合物。

澳大利亚西海岸和南海岸有着丰富的海浪资源，一旦技术允许，这些海浪资源就可以用来发电。BioPower Systems Pty Ltd公司正致力于开发能转换海浪和潮汐资源的新系统。该系统模仿了新型海洋资源转换发展过程中自然程序运用的许多可取之处。在2008年全面验证测试之前，2007年全年该公司都在进行此系统概念验证的工作。

澳大利亚地表5公里内还储存有大量的产高热花岗岩资源。不少公司已经在库珀/埃罗曼加盆地开始探测高温岩体地热资源。据估计，这些地区所蕴含的能源相当于全国800年的电量需求。

澳大利亚是氢能经济国际伙伴计划的一名积极成员。氢能经济国际伙伴计划旨在为使用氢能制定相关的规定和标准，并且促进氢能与燃料电池科技的发展。

2005年5月公布的澳大利亚氢能活动报告已确定，全国共有120多个氢能研究计划正在实施，这些研究涉及至少36个不同的组织。报告显示，澳大利亚已经充分准备好加入国际研究大潮中并和其他国家就氢能利用技术方面进行合作。

澳大利亚联邦科学与工业研究组织成立了国家储氢材料联盟，该联盟旨在开发产生和储存氢能的新型材料。

公平的法律法规、大量的风险投资资金、优惠的研发税费、尖端的科技和雄厚的技术商业化资金、国外可再生能源发电计划的推动、能源市场的改革以及相关国际协定，这一切都促进了澳大利亚可再生资源科技的开发和利用。

2006年1月，亚太地区清洁发展和气候新伙伴计划(AP6)在澳大利亚正式启动，参与的国家包括澳大利亚、美国、韩国、中国、印度和日本。这个新伙伴计划实施的目的在于促进研发、部署以及相互交流清洁能源利用在科技和经验上的合作。

在该计划的促进下，澳大利亚政府在可再生资源科技的强势发展上投资了2,500万澳元。这项资金使澳大利亚对气候变化的投资增加到了近20亿澳元，并且使澳大利亚对低排放技术和可再生资源的投入再攀11亿澳元新高。

可再生资源是澳大利亚未来能源需求的主要组成部分。规模不断扩大的创新工业，丰富的自然资源，拥有世界级基础设施的密集研发基地，以及乐于从事/接受新技术的人群越来越多地与政府的物质支持结合在一起，这一切确保了创新企业在澳大利亚有大的发展空间并有望向世界展示他们的技术以及能源解决方案。

核心词汇

inevitably [in'evitəbli] *adv.* 不可避免地

innovative ['inəuveitiv] *adj.* 革新的，创新的

install [in'stɔ:l] *vt.* 安装，安置

renewable [ri'nju(:)əbl] *adj.* 可更新的，可继续的

photovoltaic [,fəutəuvɔl'teiik] *adj.* 光电池的，光伏发电的

silicon ['silikən] *n.* 硅

concentrator ['kɔnsəntreitə] *n.* 集线器，集中器

hydro ['haidrəu] *n.* 水力发电

sugarcane ['ʃugəkein] *n.* 甘蔗

plantation [plæn'teiʃən] *n.* 种植园

bagasse [bə'gæs] *n.* 甘蔗渣

hydrocarbon [,haidrəu'kɑ:bən] *n.* 碳氢化合物

algae ['ældʒi:] *n.* 水藻，海藻

ethanol ['eθənɔ:l] *n.* 酒精，乙醇

lignocellulose [,lignəu'selju,ləus] *n.* 木质纤维素

harness ['hɑ:nis] *vt.* 利用产生动力，运用

prototype ['prəutətaip] *n.* 原型

granite ['grænit] *n.* 花岗石

geothermal [,dʒi(:)əu'θəməl] *adj.* 地热的

venture ['ventʃə] *n.* 冒险，风险

infrastructure ['infrəstrʌktʃə] *n.* 基础结构，基础设施

Navigation and Orientation

48. 导航和定向

机经选粹

这一篇讲的是birds的定位方式，鸟的迁徙以及如何找到归途。



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Navigation and Orientation

The question of how birds find their way between breeding and wintering grounds has puzzled people for as long as they have been aware of the phenomenon of migration. Today we know many more parts of the puzzle's solution than we did even twenty-five years ago. Some would argue that there are really two puzzles: (1) how birds navigate over thousands of miles to find their way between breeding and wintering sites, and (2) how birds find their way back to precise nesting or roosting sites (homing behavior). To do either, birds must be able to orient (that is, determine compass direction) and to navigate (judge their position while traveling).

The short explanation of these complex phenomena is that birds find their way by using a variety of cues in a hierarchical fashion. Different species may use these cues in different orders of priority, and some cues may always be used in preference to others. Birds acquire directional information from five primary sources: (1) topographic features, including wind direction which can be influenced by major land forms, (2) stars, (3) sun, (4) Earth's magnetic field, and (5) odors.

Some of the most convincing experiments demonstrating the navigational abilities of birds were performed by behavioral ecologist Stephen Emlen. He took advantage of the "migratory restlessness" of caged migrant birds—fluttering and hopping that tend to be oriented in the direction of migration. Using Indigo Buntings in a planetarium, Emlen found that the birds oriented in the proper migratory direction using the

stellar cues projected onto the planetarium ceiling. When Emlen shifted the position of the planetarium's stars, the birds shifted their orientation as well. The buntings were shown to learn a "sky map" as they watch the rotation of the stars while they grow up. The young birds learn to recognize the area of least apparent movement around the pole; if maturing buntings were exposed to a false sky rotating around the star Betelgeuse (in the constellation Orion), they acted as if Betelgeuse were the North Star.

But how do birds find their way on overcast nights? Apparently, they are able to set course by the setting sun, unless this too is obscured by cloud cover. Lacking either stars or sun for information, birds will orient by wind direction, although not always correctly. Ornithologist Kenneth Able used radar and portable ceilometers (electronic devices for measuring the altitude of overcasts) to track nocturnal migrants and reported that birds frequently flew in the wrong direction by using wind as a cue when stars were unavailable. Interestingly, while most ornithologists believe that birds employ topographic features like mountains, rivers, tall buildings, etc., to navigate in the vicinity of the home site, there is little evidence of the use of such cues.

Recent experiments have revealed that pigeons are capable of detecting the Earth's magnetic field and can use it to orient and possibly to navigate. We still do not understand just how pigeons manage to sense such weak electromagnetic fields, but birds are far more sensitive to them than are human beings. We have yet to learn how widespread this ability may be among other species of birds.

Homing pigeons, in addition to sensing magnetic fields, recently have been shown to use smell for at least short-distance orientation in returning to their loft. Earlier studies indicated that Leach's Storm-Petrels (and probably other "tubenoses") might possibly use their sense of smell to locate their nest burrows, although they rely on other cues to find the colony. Shearwaters, like pigeons, are capable of spectacular homing feats. Many Shearwaters were taken from their nest burrows off the coast of England, transported across the Atlantic Ocean, and released near Boston. Twelve and a half days later some of these individuals were back in their nest burrows. How they accomplished the feat is unknown, but they certainly didn't sniff their way home.

One clear message emerges from studies of avian orientation and navigation: birds do not rely on a single source of information to guide them on their travels. Instead, they possess the ability, shaped over evolutionary time, to use redundant cues from a variety of sources. Such a system enables birds to find their way under most conditions that they routinely encounter.





鸟类如何寻找在繁殖地和越冬区之间的路线？这个问题自意识到鸟类迁徙的现象后就始终困扰着人们。与25年前相比，我们如今对于此困惑有了更多的了解。有人认为，确实存在两个不解之谜：(1)鸟类是如何导航测定找到繁殖地和越冬区之间数千里之遥的路线的；(2)鸟类是如何精确地找寻到回鸟巢的路(归巢行为)的。要做到两件事中的任何一件，鸟类必须具备定向(即确定罗盘方向)的能力和导向(在飞行过程中辨认方位)的能力。

对于这些复杂现象的一种简单解释是，鸟类采用一系列等级式的线索来辨别路线。或许不同种类的鸟在使用这些线索时会采取不同的优先顺序，或许一些线索可能总是被别的线索更受鸟类青睐。鸟类从5个主要来源来获取定位信息：(1)包括会受主要地貌影响的风向在内的地形特征；(2)星辰；(3)太阳；(4)地球的磁场；(5)气味。

最令人信服的论证鸟类导航能力的试验中有一些是由行为主义生态学者史蒂芬·艾莫林所进行的。他利用了关在鸟笼里的候鸟的“迁移性焦躁”——这些候鸟不停地振翅希望辨认出迁徙的方向。艾莫林把靛彩巫抓到天文台，他发现鸟利用天文台天花板投射的星形线索辨认出了正确的迁徙方向。当艾莫林移动天文台里恒星位置时，靛彩巫也相应地改变方向。这些靛彩巫已经会识别“星宿图”，因为它们在长大的同时也在观察星体的旋转。小靛彩巫学习识别极地附近发生的最细微的移动。如果将成年靛彩巫放在一片星辰位置改变了的，也就是围绕参宿四(处于猎户星座中)转动过的天空下，这些成年靛彩巫会把参宿四星当作北极星来指挥自身的行动。

但是鸟类如何在漆黑的夜晚认路呢？显然，它们能够根据落日来设定航向，除非太阳也被云遮住了。如果没有星星、太阳提供信息，鸟类将根据风向辨认方向，尽管这并非总是正确的。鸟类学家肯尼思·艾伯用雷达和便携式云高计(测算云高的一种光电设备)跟踪夜间活动的候鸟，并报道说在没有星星时鸟类以风定向经常飞错方向。有趣地是，尽管大多数鸟类学家认为鸟类在居住地附近借助地形特征如高山、河流、高层建筑物等来导向，但是却很少有证据证明鸟类利用这些线索。

近期试验显示，鸽子能够探测到地球磁场，然后利用磁场进行定向，或者可能用来进行导航。至今我们仍不清楚鸽子如何感应如此微弱的电磁场，但是与人类相比，鸟类对电磁场的感应要敏感得多。我们迟早得知道这种能力在其他鸟类中可能会有多普遍。

信鸽除了能感应磁场外，最近被发现它们归巢时至少在短距离内能利用气味来定向。早期的研究指出，白腰叉尾海燕(或者是其他“管鼻鱼”)可能利用嗅觉来确定它们巢穴的位置，尽管寻找巢穴时它们也依赖其他线索。和鸽子一样，海鸥也有惊

人的归巢壮举。许多海鸥飞离英国海岸的巢穴，飞越大西洋，最后在波士顿附近停歇。十二天半后，一些海鸥返回了巢穴。这些海鸥是如何完成这项壮举的仍不得而知，但是它们一定不是嗅回家的。

在鸟类定向导航的研究中得出了一个明确的信息：飞行旅途中的鸟类不是依赖单一的信息来源导向的。相反，在不断进化过程中，它们拥有了从一系列信息来源中利用多种线索的能力。这样的一个能力系统使鸟类在日常遇到的大多数环境中都能够辨认方向。

核心词汇

roosting [ru:stiŋ] *adj.* 栖息的
determine [di'tə:min] *vt.* 决定，决心要
hierarchical [,haiə'rɑ:kikəl] *adj.* 分层的，体系的
topographic [,tɔpə'græfik] *adj.* 地志的，地形学上的
odor ['əudə] *n.* 气味，名声
ecologist [i'kɔlədʒist] *n.* 生态学家
planetarium [,plæni'teəriəm] *n.* 天文馆
bunting ['bʌntiŋ] *n.* '鸟' 巫
ornithologist [,ɔ:ni'θɔlədʒist] *n.* 鸟类学家
radar ['reidə] *n.* 雷达
ceilometer [si:'lɔmitə] *n.* 云高计
altitude ['æltitju:d] *n.* 高度，海拔
overcast ['əuvəka:st] *n.* 阴天，云彩
vicinity [vi'siniti] *n.* 邻近，附近
sensitive ['sensitiv] *adj.* 敏感的
burrow ['bʌrəu] *n.*地洞，洞穴
evolutionary [,i:və'lu:ʃənəri] *adj.* 发展的
redundant [ri'dʌndənt] *adj.* 多余的

Meet the Air Aces

49. 认识飞行能手

机经选粹

这一篇研究昆虫的翅膀与飞机的关系。

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Meet the Air Aces

Among nature's most incredible machines of the air are insects such as the bumblebee and the housefly.

Typically not much more than 1cm long and weighing less than a quarter of a gram, these tiny aeronauts are capable of incredible bursts of speed and manoeuvrability.

Some bees, for instance, can belt along at 64kph—scaled up, that would be the equivalent of an airliner travelling at more than 160,000kph! *Houseflies can take off backwards and change direction by 90 degrees in a fraction of a second, pulling g-forces that would leave a fighter pilot pounded to pulp.*

Insects break all the rules of aerodynamics—at least, that is, the rules understood by aircraft designers.

With their blunt noses and complicated, messy shapes, most are about as streamlined as a double-decker bus.

Their bodies are relatively heavy, and their wings are small. And yet these creatures are, by weight, the best fliers on the planet—and have been for 400 million years.

The mystery is, how on earth do they do it?

A painstaking new study shows that when it comes to understanding these miracles of evolution, we still have a long way to go.

The flight of the bumblebee has had scientists in a buzz since the 1930s, when Swedish researchers measured the insect's wing surface area, weight, and the speed at which it was able to flap its wings.

They found that—according to how aerodynamics was then understood—the bumblebee should never get off the ground.

Their conclusion became an enduring scientific myth (although the aerodynamics of bee flight was a mystery, no one suggested it broke any physical laws) and a metaphor for achieving the impossible.

For decades, the mystery remained unsolved but then five years ago scientists at Cambridge University claimed they had an answer. The key, they said, was the beating wing tips of insects create tiny vortices—whirlpools—along the front edge of the wing during the downstroke.

Dr. Charles Ellington, who used a robotic insect to generate his results, said these vortices create tiny regions of very low pressure, mini-vacuums which stick to the wing, creating lift and drawing it upwards.

A similar effect happens along the triangular, swept-back wings of supersonic aircraft—known as delta wings—and it has been named the Concorde effect.

Ellington's insect was a scaled-up, yard-wide version of the hawk-moth wing. He squirted smoke over it so he could observe the airflow across it in three dimensions. Further experiments used real insects trapped in a wind tunnel, with smoke blowing over their wings and time-lapse cameras recording the results.

Slowly, the problem of insect flight was being solved—or so it seemed. But doubt has now been cast on the theory, with a study published in the current issue of *Nature* magazine. The study claims that insect flight is far more complex than was imagined.

Professors Michael Dickinson and James Birch, of the University of California, have made the most detailed study ever of how air moves over an insect wing. Their experiment and the results are complex, but the conclusion is simple: we still don't understand exactly how these creatures can get off the ground.

Dickinson and Birch used a sophisticated robot model of a pair of insect wings, specifically the wings of the fruit fly (Drosophila melanogaster), which is commonly used in laboratory experiments.

Because the robofly was much larger than a real insect, the wings were placed and operated in a tank of mineral oil rather than air. The tenuous atmosphere that we hardly notice seems as thick as syrup to a quarter-inch-long insect.

After analysing the flight of the robofly in the tank of oil, and painstakingly measuring the currents generated by the wings, the scientists had to concede defeat. They simply couldn't explain how the lift-generating whirlpools that keep the fly aloft manage to adhere to the insect's wings. So it was back to the drawing board.

Insect wings are incredibly complicated. They beat thousands of times a minute, and perhaps it's not surprising the aerodynamics of their flight are still poorly understood by scientists.

It comes as more of a shock to learn even the simple aerodynamics of aircraft wings may not be what they seem, either.

Earlier this year, *New Scientist* magazine published a report claiming our theories about how aircraft fly have been wrong for nearly a century.

Ever since the Wright brothers took to the air in the first powered, heavier-than-air aircraft over North Carolina 98 years ago, it has been assumed the reason planes can fly is down to something called the Bernoulli effect. Because the top of a plane's wing is curved and the bottom is flat, the air rushes faster over the upper surface, with an accompanying reduction in pressure. Like the vortices on an insect wing, this low pressure area sucks the wing upwards, so the theory goes.

Now David Anderson, an American government physicist, says this is wrong. If the shape of a wing determined lift, he pointed out, you could never fly upside down.

He has a point. If aerofoils (the name for wings that are curved in cross-section) are really necessary to generate lift, all those pilots at air shows who fly upside down for 10 seconds at a time should plough into the ground.

Anderson's explanation is the shape of the wing is mostly irrelevant. He says wings are forced upwards because they are tilted—which forces air down, generating an equal and opposite force upwards. This is why small model planes (and the latest fighter jets) with flat wings can fly, and also explains how kites stay aloft.

That planes fly thanks to one of Isaac Newton's simple laws, rather than the more complex fluid dynamics of Bernoulli, is a startling reminder that even in this era, when sometimes a million humans may be aloft in any one day, the science of flight—natural or man-made—is still in its infancy.

Insect flight has been, and remains, mysterious. *Perhaps by the 100th anniversary of the Wright brothers flight over the dunes of Kitty Hawk in 2003, we shall have figured out just how they do it.*

参考译文

像大黄蜂和家蝇这样的昆虫是大自然中最神奇的飞行物。

身长不超过1厘米，体重不到0.25克，这些微小的飞行家们却有着令人难以置信的速度和灵敏度。

例如，有些蜜蜂能以每小时64千米的速度环绕飞行，扩大到相应比例，这个速度相当于一架大型客机以每小时16万千米的速度飞行！

昆虫打破了空气动力学的所有规则，或者至少打破了飞机设计者们所认为的规则。

嗅觉迟钝、外形复杂而没有条理，它们大部分没有什么所谓“流线型”身躯，就像双层巴士一样。

他们的身体相对笨重，翅膀短小。但就体重而言，这些小生物是这个星球上最棒的飞行家，而且4亿年来都是如此。

谜团是，它们究竟是怎么办到的呢？

一项艰苦的新的研究结果表明，要揭开这种进化的奇迹，我们还有很长的路要走。

20世纪30年代，瑞典的研究者们测量了大黄蜂翅膀的面积、重量及其振翅所能达到的速度，从那时起，大黄蜂的飞行就让科学家们兴奋不已了。

他们发现，根据当时的空气动力学的观点，明白了：大黄蜂应该是永远都不可能飞离地面的。

他们的结论成为永久的科学之谜(尽管蜜蜂飞行过程中的空气动力学也是个谜，但是没有人认为它违反了任何物理学规则)，并用隐喻的手法告诉人们这是一个不可能实现的目标。

几十年来，这个谜底一直都没有被揭开，直到5年前，剑桥大学的科学家们声称他们找到了答案。他们说，谜底就是，在昆虫向下俯冲时，翅膀的拍动会使翅尖在翅膀前缘产生微型漩涡——涡流。

查尔斯·埃林顿博士是使用机器昆虫得出这个结论的。他指出这些涡流产生了一些附在昆虫翅膀上的低压微型真空区域，这些低压真空区域为昆虫提供了上升的动力和向前的推动力。

类似效应产生于超音速飞机的三角形后掠机翼——也就是三角翼，而且这种效应已被命名为“协和效应”。

埃林顿的机械翅膀是天蛾翅膀的加长加大版。他往机械翅膀的周围喷射了烟雾，这样便能立体地观察气体流动。继而，他还利用真正的昆虫做了进一步的研究，把昆虫困在风洞中，让烟雾吹向它们的翅膀，并用定时拍摄照相机记录下实验结果。

慢慢地，昆虫飞行原理的问题得到了解决——或者说似乎得到解决了。但是这个理论现在又遭到了质疑，质疑来自最近一期《自然》杂志上刊登的一篇论文。该论文指出，昆虫的飞行原理要比想象中复杂得多。

加州大学的迈克尔·迪金森和詹姆斯·布姬教授曾经对空气在昆虫翅膀间的流动方式做了最细致的研究，他们的实验过程和结果都很复杂，但结论却很简单：我们依然无法确切得知这些生物是怎样飞离地面的。

迪金森和布姬的实验使用了一对有昆虫翅膀的复杂的机械模型，具体说是果蝇(黑腹果蝇)的翅膀。果蝇经常被用于实验室实验。



因为机械翅膀比真正的昆虫翅膀要大得多，因此它被置入一罐矿物油中进行实验，而不是空气中。我们几乎忽视的稀薄的空气，对于一个1/4英寸长的昆虫来说，就像糖浆那么黏稠。

在分析完机器翅膀在这罐矿物油中的飞行，小心地测量了翅膀产生的气流后，科学家们不得不宣告失败。他们甚至连这些能保持翅膀飞在半空、产生上升气流的漩涡是怎么附在昆虫翅膀上的都解释不了。于是，一切又回到了原点。

昆虫翅膀的复杂程度令人难以置信。它们每分钟能振动成千上万次。也许，科学家们对昆虫飞行中的空气动力学仍然知之甚少也不足为奇。

更让人震惊的是，甚至机翼那简单的空气动力学原理也可能不是像它们表面上看起来的那样。

今年年初，《新科学家》杂志上发表了一篇报道，报道中指出，近一个世纪以来，我们关于飞行器是如何飞行的理论一直都是错误的。

自从98年前，莱特兄弟驾驶第一架动力型、重于空气的飞机穿越北卡罗来纳以来，人们就一致认为飞机的飞翔是因为伯努利效应。通常大家认为的理论是这样的：因为飞机机翼的翼梢是曲线型的，而底部是平的，空气在流经上表面时速度更快，同时压力会减小，于是就如同昆虫翅膀产生涡流那样，这个低压区域会将机翼向上吸。

而现在，美国物理学家大卫·安德森博士说，这个观点是错误的。他指出，如果机翼的形状能决定上升力，那么飞机永远都不可能倒着飞。

他有一个观点：如果真的需要气翼(横截面弯曲的机翼名称)来产生升力，那么在飞行表演中表演一次性10秒钟倒飞的所有的飞行员都会连人带机撞向地面。

安德森的解释认为机翼形状之说基本是行不通的。他说机翼被向上托起是因为他们是倾斜的——将空气下压，得到一个平衡的使之上升的反作用力。这就是带有平板机翼的小型模型飞机(和最新式的战斗机)能够飞行的原因，也是对风筝为什么能在空中飞行的解释。

飞机能起飞，多亏了牛顿的简单定律之一，而不是伯努利复杂的流体动力学。这个事实使我们吃惊地认识到：即使是在这个每天都有一百万人能被带到空中的时代，人类对于飞行的奥妙的探索——无论是自然的或人造的——都仍然处于初始阶段。

昆虫的飞行一直都是一个谜，现仍如是。

核心词汇

bumblebee ['bʌmbl,bi:] *n.* 大黄蜂，熊蜂
manoeuvrability [mə,nu:vrə'biliti] *n.* 可操纵性
blunt [blʌnt] *adj.* 迟钝的
streamlined ['stri:mlaind] *adj.* 流线型的
miracle ['mirəkl] *n.* 奇迹，奇事
enduring [in'djuəriŋ] *adj.* 持久的，忍耐的
metaphor ['metəfə] *n.* 隐喻，暗喻
downstroke ['daun,strəuk] *n.* 活塞下降行程
robotic [rəu'bɔtic] *adj.* 机器人的
vortices ['vɔ:tisi:z] *n.* 旋涡
triangular [trai'æŋgjulə] *adj.* 三角形的
tunnel ['tʌnl] *n.* 隧道，地下道
model ['mɔdl] *n.* 模型，模特儿
painstakingly ['peinz,teikiŋli] *adv.* 费力地，苦心地
aloft [ə'lɔft] *adv.* 在高处，在上
poorly ['puəli] *adv.* 不充分地，贫乏地
aircraft ['ɛəkra:ft] *n.* 飞机
suck [sʌk] *vt.* 吸，吮吸
plough [plau] *vt.* 耕，撞
dynamics [dai'næmiks] *n.* 力学，动力学

The Stuff of Genius

50. 天才的本质

机经选粹

这一篇讲的是关于天才的本质（nature of genius）。

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The Stuff of Genius

In GLOSSY AD CAMPAIGNS, multinational corporations promote the genius of their products by linking them to the genius of Albert Einstein.

Einstein has become, since his death 30 years ago, so perfect and entrenched a symbol of that most exalted and elusive of human qualities that even businessmen have come to respect the value of a man who could never keep track of his money. So it comes as no surprise that scientists are still trying to find out what made him so smart—and that they're trying to do it in what seems to be the most logical way of all, by studying his brain.

One group of neuroanatomists, working in California, recently managed to find the brain in Missouri. It had been preserved and stored for years behind a beer cooler in a cardboard box in Kansas, and was moved when the pathologist who performed the autopsy on Einstein relocated. The neuroanatomists—a group headed by Drs. Marian C. Diamond and Arnold B. Scheibel—were able to convince the pathologist to send them four small pieces of the brain, which they proceeded to examine microscopically. And what they found led them to believe that one of those pieces contained tissue that may have played a specific role in the expression of Einstein's genius.

These findings provoked considerable notice, and some controversy, among neuroscientists. What may not have been noticed, however, was the long history of

which the Einstein study was a part. That history, which includes chapters about other remarkable brains, such as that of V.I. Lenin, may reveal more about the way in which we seem compelled to see genius, and about the power that geniuses have to captivate and beguile us, than it does about the causes of genius itself. in 1925, a year after lenin's death, the Soviet government invited Prof. Oskar Vogt, director of the Kaiser Wilhelm Brain Institute in Berlin, to examine the late Soviet leader's brain. Vogt was summoned to establish an institute in Moscow entirely devoted to the purpose of discovering the "materialist" (that is, "physical") basis for Lenin's political and philosophical genius.

In 1927, according to a Pravda news story, Vogt informed high Soviet officials that he had managed to make 34,000 slices of the brain for study. And soon after the appearance of the Pravda story, the Journal of the American Medical Association was able to share Vogt's inspiring report:

"The marked development of the pyramidal cells [in Lenin's cerebral cortex] produced, of necessity, an intensification of the general activity of the various divisions of the brain. The large number of paths proceeding from the pyramidal cells and thus uniting portions of the brain otherwise widely separated explains, furthermore, the wide range and the multiplicity of ideas that developed in the brain of Lenin, and, particularly, his capacity for quickly getting his bearings when confronted with the most complex situations and problems. This multiplicity of ideas, together with the wide range and the rapidity of his powers of conception, produced in Lenin unusual powers of intuition. Lenin's brain activity can be compared, in other words, with a whole wave of sounds, closely interwoven, rapidly tumbling over one another, yet so combined as to produce a mighty harmony. Thus the key to a materialistic view of Lenin's genius has been found."

Vogt's plans for further research on Lenin's brain were, according to an account by Stefan T. Possony in his book "Lenin: The Compulsive Revolutionary," quite ambitious. Plans for the examination of brains whose owners were still alive were drawn up, with sights set on the eventual acquisition of the cerebral hemispheres of such Soviet geniuses as the writer Maxim Gorky, the poet Vladimir Mayakovsky and, most intriguing, Ivan Pavlov, discoverer of the conditioned reflex. Soon enough, however, Soviet authorities became uncomfortable with Vogt's views on brain differences among races. By 1930 he was back in Germany, and the Moscow Brain Institute began to interest itself in subjects other than Lenin's brain.

The case of Lenin was just one in a series of efforts to discover the neuroanatomical basis of genius. The brain of Marshal Jozef Pilsudski, who was head of state and then Prime Minister of Poland between the wars, was also cut into slices—13,000, to be exact—and so, too, were the brains of other outstanding European figures, including scientists, philosophers, artists and statesmen. In none of those cases was it possible to prove a relationship between neuro-anatomy and superior intellectual

gifts. to be sure, there were some features of the Einstein examination that made it different. First of all, Einstein was more clearly a genius, at least in more identifiable a way, than were Lenin, Pilsudski and others whose brains had preceded his into the laboratories of this century's neuroanatomists.

In addition, the California neuro-anatomists used a novel approach to examine Einstein's brain. The approach was based on the work of one of the scientists, Marian Diamond, who had studied the effects of enriched environments on rats. She had observed that rats placed in an environment containing other rats and various objects developed a greater number of glial cells in parts of the cerebral cortex than did rats that were environmentally deprived. Glial cells appear to provide for, among other things, the metabolic needs of neighboring neuronal cells, which presumably do the mental work of the brain. Thus Dr. Diamond had reason to believe that the increase in the number of glial cells may have reflected, in the environmentally enriched rats, an increased use of neuronal cells.

It was this method—the counting of neuronal and glial cells—that was used by the California researchers in their study of Einstein's brain. It appears they believed that if a particular part of his brain was used to an unusual extent in the process of his mathematical thinking, then it might be reflected in a relatively increased glial cell count in that part.

Einstein himself, they knew, had once said that productive thought results from "a combinatory play of signs and more or less clear images". And so the neuroanatomists asked for parts of his brain from both the left and right hemispheres containing areas known as "9" and "39," which they suspected might be involved in such an interplay.

The neuroanatomists found that in area 39 of Einstein's left hemisphere, there were significantly more glial cells for each neuronal cell than there were in the same area in the "control" brains they studied for comparison, which came from people not known to have been geniuses. The implication was that the neighboring neuronal cells, working as actively and productively as they presumably did in this area of Einstein's brain, needed more of the glial cells' metabolic services.

Yet the research poses problems that are sufficiently troublesome to make one very cautious about interpreting the findings. For example, the results would have been more convincing had areas of Einstein's brain not thought to be involved in higher mental processes been shown to be no different from the same areas in the control brains. The control brains came from former patients at a Veterans Administration hospital. But we don't know anything about those patients' medical, psychiatric or nutritional histories—factors that could account for, or at least influence, the findings.

These methodological difficulties, as well as others—some of them beyond the

neuroanatomists' control—have convinced some other neuro-scientists to suspend judgment about the results of the Einstein research. In addition, assumptions on which that research was based are conceptually problematic. The leap from the brain of an environmentally stimulated rat to that of a human mathematical genius is scientifically perilous. Genius, even of the most specialized kind, must be a very complex thing: it involves not only cognitive capacities but other psychological ones as well, and is almost surely the product of the interplay of many areas of the brain. To look for it in one area or another—and even to attribute something so nebulous as "a play of signs and images" to one particular area—goes against the little we can surmise about the ways in Einstein 5th col which human beings, including gifted human beings, think. In the light of the conceptual and practical obstacles that face any scientist who attempts to locate the anatomic basis of genius, why do scientists in one generation after the next continue to try?

One reason, certainly, must be the allure of simplicity. Despite the complexity of genius, the possibility of finding and touching it in one spot is so attractive that some neuroanatomists will probably go on trying to do so, especially if they have access to the brain of a world-famous and universally acknowledged genius.

But an even more powerful reason may have to do with the ways we see genius itself. To scientists as well as the rest of us, true genius is something so rare, so striking, so unearthly and beyond our ken, that the person who possesses it may be seen as fundamentally different—as having a brain that is somehow wired in a different way. How else to see someone who can divine what others can't? How else to see a Newton, who understood the nature of things, or a Darwin, who understood the nature of nature, or a Shakespeare, who understood how to turn things and nature and human spirit into words that spring from a page and transform our lives and thoughts?

The logical next step for a neuroanatomist may be to seize the metaphor and make it real—to search for the roots of genius in the wiring of the presumably different brain. It's an understandable step, and, for all one knows, maybe even a correct one. Maybe the California neuroanatomists, by luck or brilliant intuition, really did find an area of Einstein's brain that was involved in the expression of his genius.

But, even if they did, it's important to recognize that, great as Einstein's genius was, he was still more like other human beings than unlike them. For ordinary human intelligence, everyday human capacities, are, after all, in themselves remarkable. In spite of the recently vaunted ability of some apes to manipulate symbols, we should remember that the gap between other animals and us—between their inability to use language and our ability to know, speak and write words—is immensely greater than the gap between having language and being able to use it as Shakespeare did. The latter gap, as striking as it is, is still only a gap in the realm of function—a matter of margin and degree.

Someday we may find out whether the brains of geniuses really do work better than ours. But our knowledge of whether they do, and of how, will probably not hinge on dissecting still more brains and counting their cells. Until we find ways of examining brains and genius that are more promising than the ones we have now, perhaps we should allow ourselves to marvel at the geniuses who stun us with their presence, and do them the decency, at their deaths, of leaving their brains in peace.

参考译文

自从30年前爱因斯坦死后，他是如此完美，而且成为拥有最崇高最难揣摩的人类品质的象征，以至甚至商人也开始尊重这么个从不在意钱的人的价值。因此，科学家们仍在试图寻找是什么令他如此聪明——而且还尝试着用一种似乎是最合乎逻辑的方法去研究他的大脑，其实这也不足为奇。

他们知道，爱因斯坦自己曾经说过，活跃的思维来源于"符号的组合游戏和或多或少的清晰图像"。因此，神经解剖学家们要求从他的左右脑半球中取出部分大脑组织，这部分包含了我们通常所说的"9"和"39"区，他们怀疑这些可能与一种相互作用有关联。

神经解剖专家发现，在爱因斯坦的左脑半球的39区中，与他们研究的"控制"大脑的相同区域相比(这些大脑来自不被认为是天才的人)，很明显每个神经元细胞有更多的神经胶质细胞。言下之意就是，就像他们在爱因斯坦的脑中这个区域所做的假设一样，周边的神经元细胞运行活跃而且多产，这些神经元细胞需要更多神经胶质细胞来进行新陈代谢活动。

然而，这项研究也引发了一些十分棘手的问题，在解释这些研究结果时需要非常谨慎。举例来说，如果爱因斯坦的大脑被认为与较高的心理过程是无关的，这种过程已显示出与控制大脑的相同区域并没有不同，那么结果将会更具有说服力。这些控制大脑来自于退役军人管理局医院以前的病人。但是我们对这些病人的病史、精神病治疗史和营养史一无所知——而这些因素能解释，或至少能影响这些研究结果。

这些方法上的困难，以及其他困难—其中一些困难是在神经解剖学家控制范围之外的——已经说服了其他一些神经科学家暂停有关对爱因斯坦研究结果的判断。此外，研究所基于的假设在概念上就是有问题的。从受到环境刺激的老鼠的大脑跳跃到一个数学天才的人类大脑这一过程在科学上是很危险的。天赋，甚至是最专门的类别，都一定是一个非常复杂的东西：它不仅涉及认知能力，还涉及其他的心理能力，而且肯定是大脑许多区域相互作用的产物。在一个区域或其他区域寻找它——甚至是把一些像"符号的游戏和图像"那样模糊不清的东西归属于一个特殊区域——几乎没有违背我们用来猜测人类、包括有天赋的人思考爱因斯坦第五关口的方式。既然任何尝试去定位天才的解剖基础的科学家都面临概念上和实际上的障碍，那为什么一代一代的科学家还要继续去尝试呢？

当然，其中一个原因一定是源于简单。尽管天赋具复杂性，但在一点上发现和触及的可能性非常具有吸引力，一些精神解剖学家可能会继续去做这样的尝试，特别是如果他们

开始对世界著名和举世公认的天才的大脑进行研究的时候。

但是一个更有力的原因可能与我们看待天赋本身的方式有关。对于科学家和我们其余的人来说，真正的天赋是如此罕见、如此惊人、如此神秘，而且是在我们知识范围之外存在的，以至于拥有它的人可能会被认为是完全与众不同的——因为他拥有一个以不同方式连接的大脑。那该如何对待一个能看穿出别人不能看穿的东西的人呢？如何对待领悟出事物本性的牛顿，或者了解自然界本性的达尔文，或者懂得如何把事物、自然界和人类精神转变成从纸张上喷涌而出的、改造了我们的生活和思想的词语的莎士比亚呢？

对神经解剖学家来说，合理的下一步可能就是要抓住暗示，并使它成为现实——在可能不同的大脑连线中去探求天赋的根源。这是可以理解的一步，而且，每个人都知道，甚至可能是正确的一步。也许加州的精神解剖学家，侥幸或通过非凡的直觉，确实找到了爱因斯坦大脑中与表现他天赋有关的区域。

但是，即使他们做到了，认识到这一点很重要：爱因斯坦与其他人类相比，其相似点要比不同点要多，虽然他的天赋很伟大。对于普通人的智力，平常人的能力在自己身上毕竟都是值得注意的。尽管最近有人吹嘘一些黑猩猩有操控符号的能力，但我们应该记住，其他动物和我们之间的差距——他们无法使用语言的能力和我们理解、说话、写字的能力——比拥有语言和能像莎士比亚那样使用语言的能力之间的差距要大得多。后者的差距，尽管很惊人，但它仍然只是功能领域——关于极限和程度问题的差距。

总有一天，我们也许就会发现天才的大脑是否真的比我们的大脑能更好地运转。但我们对他们是否是这样，以及如何成为这样的认识可能不会取决于解剖更多的大脑以及细数他们的细胞数量。在我们找到比现在所拥有的更有前途的检查大脑和天才的方法之前，也许我们应该让自己去惊叹那些给我们留下深刻印象的活着的天才，而在他们死后给予尊敬，让他们的大脑得以安息。

核心词汇

entrenched [in'trentʃt] *adj.* 确立的，确定的
elusive [i'lju:siv] *adj.* 难懂的，易忘的，难捉摸的
combinatory [kɔm'bainətəri] *n.* 组合
neuroanatomist [ˌnjuərəuə'nætəmist] *n.* 神经解剖学家
interplay ['intəplei] *n.* 相互影响，相互作用
genius ['dʒi:njəs] *n.* 天才，天赋
neuronal ['njurəunl] *adj.* 神经元的
troublesome ['trʌblsəm] *adj.* 令人烦恼的，讨厌的
perilous ['periləs] *adj.* 危险的
psychological [ˌsaikə'lɔdʒikəl] *adj.* 心理(学)的
nebulous ['nebjuləs] *adj.* 星云状的，模糊的
complexity [kəm'pleksiti] *n.* 复杂(性)，复杂的事物
unearthly [ʌn'ɜ:θli] *adj.* 怪异的，异常的
understandable [ʌndə'stændəb(ə)l] *adj.* 可理解的，能够懂的
intuition [ˌintju(:)'iʃən] *n.* 直觉，直觉的知识
remarkable [ri'mɑ:kəbl] *adj.* 显著的，非凡的
ape [eip] *n.* 猿
immensely [i'mensli] *adv.* 极大地，无限地
hinge [hindʒ] *v.* 取决，靠
dissect [di'sekt] *v.* 解剖，切开



第二章 建筑科学类

A Handmade Medieval Castle Rises in Burgundy

1. 人工中世纪城堡在勃艮第兴建

机经选粹

这一篇文章讲的是关于修建城堡，一个法国人准备自己建城堡。

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A Handmade Medieval Castle Rises in Burgundy

A medieval castle is rising in a disused quarry in northern Burgundy, stone by hand-carved stone, nail by hand-made nail, cart-load by horse-drawn cart-load.

The Chateau de Guedelon is not a movie-set; it is not a restoration; it is not a theme park. Guedelon will be a full-sized castle with battlements and a moat and drawbridge and six towers. It will be constructed from scratch, by strictly medieval methods, over the next 25 years—the first castle of its kind to be built since the 13th century and the first medieval castle built anywhere for 500 years.

The 35 labourers—many of them formerly unemployed—work in medieval clothes. They eschew modern building methods (modern in this case being anything invented after circa AD 1240). All materials, and many of the tools, are quarried, gathered or made on the site: the stones, the mortar, the ropes, the nails, the saws, the timber scaffolding, the wooden lifting-engines.

After 18 months, the 10ft thick foundations and lower walls have been completed. In the next few weeks, the first tower will rise. When the castle is finished, in 2025, its creators hope to add a medieval village and then a priory.

A pall of yellowish golden dust hangs

over the site, adding, cinematically but unintentionally, a sepia-tinge. If you squint your eyes to blot out the other visitors, in cycling shorts and baseball caps, and focus instead on the castle walls, the rough shacks and clothes of the labourers, the timber scaffolding, the wood-smoke from the forge, the errant goats and geese, you might have stepped back eight centuries.

The Chateau de Guedelon is the realisation of the dream of a self-confessed "lover of old stones", Michel Guyot, a local entrepreneur, who has restored the nearby Chateau de Saint-Fargeau and is trying to rescue 15 other romantic but unwanted "ruins".

France already has an embarrassing surfeit of castles. Visits to the lesser known chateaux of the Loire are falling dramatically. Why go to the bother of constructing another one?

"Anyone who goes to a medieval castle or cathedral cannot help but wonder how on earth our ancestors built such things," said Mr Guyot, 51, a playful, boyish but determined man. "For many years, I wanted to find out by doing what they did, by building a medieval castle in the medieval way. One day, I made up my mind that it must be now or never. You only have one life."

His aim is to solve some of the mysteries about how such castles were built; to recreate old skills; to provide jobs and a tourist attraction. The chosen era is the first third of the 12th century, a period of intensive castle—building by upwardly mobile barons in France (and England). A committee of academic experts advises on what is medievally correct. Initial funding came not from pillaging the local peasantry but from regional councils, the European Union and several large companies. Guedelon, 100 miles south-east of Paris, has to fund itself from entrance fees, by the end of next year.

The castle is not just an architectural experiment but also a "social experiment", according to the site manager, Maryline Martin. How do you adapt the 35-hour working week, laid down by French law, to a medieval building site? How do you cope with modern regulations on safety in the workplace? What exactly is medievally correct? Which modern habits and practices are acceptable or at least unavoidable? Can the workers have cigarettes? (yes). Watches? (no). Spectacles? (yes). Hard-hats? (sometimes). The 35-hour week is respected, by calculating an annual average. Work closes down in the winter, when the labourers and craftsmen undergo training (including training in modern building techniques) and enjoy something undreamt of by their 13th-century predecessors: paid holidays.

One issue still unresolved is the use of the two wooden cranes, built according to surviving medieval plans, which are operated by human tread-mills, known as "squirrel cages". The work inspectorate of the 20th-century French state declared them unsafe and inhuman. Negotiations are in progress with the "works delegates" (another, acceptable post 13th-century intrusion) to allow the builders to take turns operating them for 15 minutes at a time.

"What has been fascinating is to see the modern craftsmen and labourers adapt to a medieval concept of time," Ms Martin said. "There is no rush; no pressure. And yet if anything we are ahead of schedule. No one sneaks off early or spends longer than they are supposed to at lunch. There are no quarrels or screaming matches. The builders have themselves rediscovered the importance of team-work. If one craftsman is missing, say the blacksmith, and we run out of nails, the whole site has virtually to close down."

The number of work accidents is officially recorded as 50 percent less than on modern building sites. There have been no strikes.

By trial and error, the late 20th-century builders have solved two mysteries which have long defeated, or divided, architectural historians. What kind of mortar was used in medieval buildings? What are the strange, cabalistic inscriptions on the dressed stones?

It turned out, after several false starts, that the kind of mortar which works best is a mixture of quicklime and rough sand. (It also turns out that its chemical properties match almost exactly those of old pieces of mortar recovered from 13th-century ruins near by.) The runic marks on the stones were simple "building kit" instructions, to tell the masons where each stone should fit.

"When Guedelon is finished," Mr Guyot promised, "the seigneur will arrive on his white charger to take possession of his property." Mr Guyot will be in his mid-seventies by then but he clearly intends that the seigneur should be himself.

And then what? "It would be natural for a new castle to attract a village outside its walls. That would take another 50 years. Then we could build a priory. That would take us, not me but whoever follows, up to the end of the 21st century." Mr Guyot gave a sly smile. "After that, maybe a cathedral..."

The Chateau de Guedelon is near the villages of Saint Sauveur-en-Puisaye and Saint-Fargeau in the department of the Yonne, just to the west of the main A6 autoroute from Paris to Lyons and the south. It is signposted from both villages. In August, it is open every day from 10 am to 7pm. From 1 September to 15 November, it opens from 10am to 5.30pm.)

参考译文

一座中世纪的城堡正在勃艮第北部的一个废弃的采石场兴建，这座城堡的每块石头都是手工雕刻的，每颗钉子都是手工制作的，每辆拖车都是由马拉的。

歌德隆城堡不是摄影场，也不是重修的古建筑，更不是主题公园，而将是一座有城垛、护城河、吊桥以及6个箭塔的标准城堡。在未来的25年，一切从零开始，它将严格按照中世纪的建筑方法，被建成自13世纪以来的第一座这种风格的城堡，同

时它也是500年来的第一座中世纪城堡。

35个劳动者穿着中世纪的服装工作，这35人中有很多人以前是失业者。他们避开现代的建筑方法(这里的现代是指大约公元1240年后所发明的东西)，所有的材料和很多工具，包括石块、砂浆、绳索、钉、锯、木制脚手架、木制提升机都是在工地上开采、搜集或者制作的。

18个月以后，10英尺厚的地基和下面的城墙已经完工。在接下来的几个星期，第一个箭塔将会建立起来。到2025年城堡竣工时，它的设计者希望加建一个中世纪村庄，然后再建一个小修道院。

金黄色的沙尘笼罩在工地上空，犹如影效般，却无意中给城堡增添了一抹棕褐色的神秘色彩。你若是眯着眼，越过那些穿着休闲短车裤、戴着棒球帽的游客，远观那些城堡的城墙、简陋的棚屋、工人的服装、木制脚手架、从熔铁炉里飘出的炊烟、悠闲地四处走动的山羊和鹅，仿佛回到了8世纪。

地方企业家米歇尔·古约坦言他是“旧石器爱好者”，歌德隆城堡就是他梦想的实现。他整修了附近的圣法尔若城堡，并试图挽救其他15个颇具浪漫色彩但已闲置的“废墟”。

法国已经陷于城堡过多的尴尬境地了，那些卢瓦尔河知名度较低的城堡的参观者每况愈下。那为什么还要费力再建一个城堡呢?

古约先生说：“任何去过中世纪城堡或者大教堂的人无不惊叹我们的祖先究竟是怎样建造出这样的东西的。”他51岁，幽默、富有孩子气，却也十分执着。“多年来，我就想通过做他们当年做的事，通过用中世纪的方式建造一座中世纪城堡，来找到答案。有一天，我下定决心，现在就必须行动，否则永远都不会有机会了，因为你的生命只有一次。”

他的目标是揭开这种城堡的建造之谜，再现古代的建造技术，提供就业机会和吸引游客。他所选择的时代是12世纪的前1/3时期，这是一个城堡辈出的时期，这些城堡是由在法国(及英格兰)不断受到提拔的男爵们建造的。有一个学术专家委员会为中世纪时期的正确标准提供了意见。最初的资金不是来源于对当地农民的掠夺，而是来源于地方议会、欧盟和几个大公司。距巴黎东南部100英里的歌德龙城堡不得不在明年年底前一直从门票中筹集资金。

一个至今仍未解决的问题是2个木制起重机的使用，它是根据残存的中世纪设计图制造的，由被称为“松鼠笼”的人工脚踏轧机操纵。20世纪的法国工作督察宣布它们是不安全、不人道的。与“工会代表”(另一个已经接受了后13世纪的入侵的)的谈判进展顺利，工会已允许建筑工人采取轮流作业，每次操作15分钟。

“一直很令人着迷的是看到现代工匠和劳动者适应了中世纪的时间概念，”马丁女士说：“没有繁忙，也没有压力。如果要说有什么，那就是我们任务的提前完成。没有人提早溜走，或者午餐时超过规定的时间，也没有人争吵或者大声尖叫。建筑工人已重新发现团队协作精神的重要性，如果一个工匠不在岗，比如说是铁匠，而且我们钉子也用完了，那整个工地就差不多得停止工作。”

正式记录的工作意外事故的数量比在现代建筑工地上的少50%，而且一直没有罢工事件发生。

通过不断的尝试和失误，20世纪晚期的施工人员已经解决了建筑史学家长期困惑或存在分歧的2个谜团：中世纪的建筑物用的是哪种砂浆？在打磨的石头上出现的奇怪而神秘的铭文是什么？

经过几次错误的尝试，原来那种最好

用的砂浆是生石灰和粗沙的混合物。(结果还表明它的化学性质几乎与从附近13世纪的废墟里发掘出的那些古老的砂浆块完全相符。)石头上的古代北欧文字符号是“建筑工具”的简单使用说明，它们告诉泥瓦匠每个石头应该用在哪里。

“当歌德龙城堡完工以后，”古约先生希望，“领主将会骑着他的白色战马来接收他的财产。”古约先生到那时已是75岁高龄了，但他明确表示这个领主应该就是他自己。

接下来会怎样呢？“对一座新的城堡来说，在城墙外建一个村庄是很自然的事情。那会再花掉一个50年。然后我们可以建一个小修道院，那将把我们，不是我而是接下来的任何人，带到21世纪末。”古约先生会心地微笑了，“之后，也许就是一座大教堂……”

核心词汇

quarry ['kwɔri] *n.* 采石场
battlement ['bætlmənt] *n.* 城垛，防卫墙
drawbridge ['drɔ:bridʒ] *n.* 吊桥
scratch [skrætʃ] *n.* 零分
eschew [is'tʃu:] *vt.* 避开，远避
gather ['gæðə] *v.* 使聚集，搜集
mortar ['mɔ:tə] *n.* 灰泥
priory ['praiəri] *n.* 小修道院
cinematically [ˌsini'mætikəli] *adv.* 用电影方式
labourer ['leibərə] *n.* 工人
realisation [ˌriəlai'zeiʃən] *n.* 实现
chateaux ['ʃa:təuz] *n.* 城堡
squirrel ['skwə:rəl] *n.* 松鼠
craftsmen ['kræftsmən] *n.* 技工，工匠
blacksmith ['blæksmiθ] *n.* 铁匠，锻工
strike [straik] *n.* 罢工
medieval [ˌmedi'i:vl] *adj.* 中世纪的
cabalistic [ˌkæbə'listik] *adj.* 神秘的
quicklime ['kwiklaim] *n.* 生石灰
mason ['meisn] *n.* 泥瓦匠
seigneur [sei'njə:, si:'njə] *n.* 领主，君主



The History of Skyscrapers

2. 摩天大楼的历史

机经选粹

这一篇是说摩天大楼的。从过去的建筑到摩天大楼的出现，再讲摩天大楼的意义、环境问题和人们对它的态度。

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The History of Skyscrapers

The desire to build big is nothing new. Big buildings have been used to show off power and wealth; to honor leaders or religious beliefs; to stretch the limits of what's possible; and even as simple competition among owners, families, architects, and builders. Some of the most dramatic buildings of the past include the pyramids in Egypt, the skinny towers stretching towards the sky in Italian hill towns, and the gothic cathedrals of France. While these types of buildings may look very different from each other, they all have one thing in common. They were built with masonry or stone walls supporting most of the weight (so-called load-bearing walls), including that of the floors, the people, and everything the rooms contained. Because of this, the height of these buildings was limited by how massive and heavy they had to be at the base.

Removing the Obstacles

Two developments in the 19th century paved the way for a whole new type of building: the skyscraper. The first was the development of a safe elevator. Primitive elevators of various designs had been used for centuries, and starting in the mid 19th century, steam-operated elevators were used to move materials in factories, mines, and warehouses. But these elevators were not considered safe for people; if the cable broke, they would plummet to the bottom of the elevator shaft. Then in 1853, an American inventor named Elisha Graves Otis developed a safety device that kept elevators from falling if a cable should break. This new development had an enormous impact on public confidence. And later in the century, the switch to an electric motor made the elevator a practical solution to



the problem of getting up and down tall buildings.

The second development took place in Chicago. In 1871, Chicago suffered a devastating fire. In the years that followed, however, instead of recovering slowly, the city experienced explosive growth, and it quickly began to strain against its natural boundaries. By the 1880s, the available land for new buildings in this area could not keep up with demand; the only alternative was to build up. But in order to achieve the desired height, construction techniques had to change. A new method of building was developed that used a grid of steel beams and columns that were strong enough to support any stresses or forces a building might experience, including both the weight of the floor and the building contents, as well as the force of wind or even, in some areas, earthquakes. And with this new building method, the skyscraper was born and the race for the tallest building began.

Modern Materials

Since the birth of the skyscraper, builders and engineers have continuously looked for ways to improve building methods and materials, in order to make structures stronger, taller, and lighter. Skyscrapers are built to last, so they must be made of materials that are strong; durable; resistant to the sun, wind, rain, frost, and snow; and affordable. Concrete is one of the most common materials, beyond the steel supports, because it is enormously versatile. Its composition can be changed depending on the needs of the building. It can be reinforced to make it stiffer and stronger by setting steel mesh or bars into the concrete. And additives can make it set or harden faster or slower depending on the needs of the design.

Another very important material is glass. Because the steel skeleton now supports the main loads of the building, the outer skin only serves to keep the weather out and let light in, the more light the better. So glass walls became very popular beginning after World War II, because they are weatherproof while providing ample natural light, and also because they are so much lighter—and cheaper—than masonry or concrete.

The Forces of Nature

But as buildings became taller and lighter, particularly the modern glass boxes that are so popular, skyscrapers began having trouble with the wind and they began to sway, some more than two feet in any direction! Engineers came up with new solutions for this problem, first installing diagonally braced steel trusses between central elevator shafts to create a stronger core, and then moving most of the beams and columns to the outside edge of the walls in order to make a stiff tube. A more unusual solution was devised to control sway in the 1970s called a tuned mass damper. This is a giant concrete block or weight, mounted with springs and shock absorbers on a lubricated plate, designed like a pendulum to move in one direction when a computer senses the structure has begun to move in the other, in order to

counterbalancethe motion

Building Badly

Of course, with new technological developments, problems can occur. One dramatic and very visible example was the John Hancock Tower in Boston, now considered the city's most spectacular building. The structure is a tower of mirrored glass. But almost from the beginning, the glass panes failed. The problem started during a winter gale in January 1973 while the tower was still under construction, when huge panels of glass, each weighing 500 pounds, shattered and fell to the street below.

The streets and sidewalks were roped off as engineers tried to figure out what was going wrong. By April at least 65 panels had fallen and been replaced by plywood. Theories and rumors persisted, including that the tower was swaying too much, causing the windows to pop out, or that the tower's foundation was settling so significantly that it broke the windows. The truth was that the material itself failed. The window units had been manufactured using a fairly new process and the design was fatally flawed. Ultimately, all 10,344 windows had to be replaced and the building has been safe ever since.

The Race for the Sky

In the early 20th century, corporations built skyscrapers for the promotional value to increase name recognition. Among the early skyscrapers in Manhattan were the Metropolitan Life Insurance Tower (700 feet, 50 stories), the Woolworth Building (the world's tallest from 1913 — 1930 at 792 feet, 60 stories), the Bank of Manhattan (927 feet, 71 stories), and the heavily decorated Chrysler Building (briefly the world's tallest in 1930 at 1,046 feet, 77 stories). The Chrysler Building soon lost its crown to the Empire State Building, built during the Depression by a real estate developer, which reached a stunning 1,250 feet and 102 stories. The Empire State Building would reign supreme among skyscrapers for 41 years until 1972, when it was surpassed by the World Trade Center (1,368 feet, 110 stories). Two years later, New York City lost the distinction of housing the tallest building when the Sears Tower was constructed in Chicago (1,450 feet, 110 stories). And twenty-four years after that, for the first time the tallest skyscraper was no longer in the United States at all, but in Kuala Lumpur, Malaysia, where the Petronas Towers were built in 1998 (1,483 feet, 88 stories).

The tallest completed building so far in the 21st century is Taipei 101, built in Taiwan in 2004, which tops out at 1,670 feet and 101 stories. But another country is eager to claim the tallest title. Currently under construction in Dubai, United Arab Emirates, the Burj Dubai is expected to be completed in 2009. As of April 2008, Burj Dubai was 2,064 feet tall with 160 completed floors. The exact height is top secret but is estimated to be at least 2,313 feet and 167 floors. If it reaches this height, which is close to a half mile tall, it will be tallest manmade structure of any kind in history.

参考译文

想要建大建筑的欲望已不再新鲜了。一直以来大建筑被用来炫耀权力和财富；表达对领导人或宗教信仰的尊崇；突破一切可能的极限；它甚至是业主、家庭、建筑师和施工人员之间的简单竞争。历史上最引人注目的建筑包括埃及金字塔、意大利山区里那些伸向天空的尖塔，还有法国哥特式大教堂等。虽然这几种建筑可能看起来大相径庭，但它们有一个共同点：都是靠砖石或石墙支撑着大部分重量(所谓的承重墙)，包括地板、人以及空间里包含的所有东西。由于这个原因，它们的高度就受限于根基的厚实度和重量。

除去障碍

19世纪2个领域的突破为一种全新的建筑——摩天大楼的出现铺平了道路。第一个是安全电梯的出现。早期各种不同设计的电梯已经运用了几个世纪，从19世纪中期开始，靠蒸汽驱动的电梯被运用在工厂、煤矿和仓库里搬运物资。但这些电梯被认为对人来说不安全，如果电缆断裂，他们将坠落到电梯的底部。之后的1853年，一名叫做伊莱沙·格雷夫斯·奥蒂斯的美国发明家发明了一种很安全的设备，可以在电缆断裂时防止电梯坠落。这种新发明给了公众极大的信心。19世纪后半叶，电动机的使用使电梯成为了一种解决上下高楼问题的实用办法。

第二个突破发生在芝加哥。1871年，芝加哥遭受了一场灾难性的大火。在接下来的几年里，这个城市不是缓慢地恢复，相反却是迅速发展，而且还很快开始和自然极限作斗争。到了19世纪80年代，这个地区用于建造住房的土地不能满足需求，唯一的选择就是往高处建。但为了达到理想的高度，建筑技术必须改变。于是一种新的建筑方法随之孕育而生了：使用钢格构柱钢梁来建造，这些钢格非常牢固，足以承受一栋楼可能要遭受的任何压力和冲击，包括地板和大楼内所有东西的重量，以及风力、甚至是一些地区地震的冲击。随着这种新的建筑方法的应用，摩天大楼也应运而生，建造最高大楼的竞赛也随之开始。

现代材料

自从摩天大楼出现以来，为了让建筑物更牢固、更高、更轻，建筑者和工程师一直在不断寻找改良建筑方法和建筑材料的各种途径。摩天大楼要矗立不倒，那用来建造它们的材料就必须很坚固，持久耐用，能够抵御阳光、风雨、霜冻和大雪，还要价格合理，让人们能负担得起。除了钢支撑架以外，混凝土是最常用的材料之一，因为它用途广泛。其成分可根据建筑的需要而改变。加入钢丝网和钢条可以让它变得更坚硬，更牢固。根据设计的需要加入添加剂还可以让它加速或者减缓凝固或变硬。

另一种很重要的材料是玻璃。由于钢架支撑着建筑物主要的负荷，外面的材料只需用来挡风遮雨和采光，光线越足越好。所以二战以后玻璃墙变得非常受欢迎，因为它们在防风雨的同时还可以提供充足的自然光线，而且也比砖石和混凝土要轻得多，便宜得多。

自然的力量

但是，随着大楼变得更高、更轻，特别是现代的玻璃框架如此流行，摩天大楼开始出现问题了：刮风时它们开始摇晃，有些大楼的振幅甚至超过2英尺！工程师就这个问题提出了新的解决办法：首先在中

心电梯井之间安装用于支撑的对角钢架，产生一个更牢固的核心；然后把大部分梁柱移到墙壁的外沿，构成一个坚硬的管道。20世纪70年代发明了一种更不同寻常的控制摇晃的仪器，叫做调谐质量阻尼器。这是一个巨大的混凝土厚块或重物，配有弹簧和减震器，弹簧和减震器安装在涂有润滑剂的金属板上。整个装置被设计得像一个钟摆，当电脑感觉到建筑物开始向一个方向移动时，它就向另一个方向移动，以此达到平衡。

大楼严重受损

当然，随着新的技术进步，问题也会不断出现。一个具有戏剧性而又显而易见的例子就是波士顿的约翰·汉考克塔，现在它被认为是这个城市最壮观的建筑。它是一座用镜像玻璃材料建成的塔。但是，几乎是从最开始，玻璃就往下掉。这个问题是从1973年1月的一场冬季狂风开始出现的，那时侯这座塔还在建造之中，重达500磅的巨大的玻璃镶板纷纷碎裂，掉到了下面的街道上。

人们用绳索把街道和人行道隔离开来，而工程师则努力要找出出错的地方。截止到4月份至少有65块玻璃镶板掉落下来，随后全部都被换成了胶合板。各种理论和谣言都在持续着，有的说这座塔摇晃得太厉害，窗玻璃都被摇掉了；而有的说这座塔的建筑意义太重大了以至于窗玻璃都破碎了。事实上是材料本身出问题了。窗户是通过一种非常新式的过程制造的，但它的设计存在着致命的缺陷。最后，1.0344万个窗户不得不全部被换掉，从此以后，这座塔也变得安全了。

核心词汇

gothic ['gɔθik] *adj.* 哥特式的
cathedral [kə'θi:drəl] *n.* 大教堂，总教堂
skyscraper ['skaiskreipə(r)] *n.* 摩天大楼，非常高的建筑
plummet ['plʌmit] *vi.* 垂直落下
solution [sə'lju:ʃən] *n.* 解决办法，解答
devastating ['devəsteitiŋ] *adj.* 破坏性的
boundary ['baundəri] *n.* 极限，边界
method ['meθəd] *n.* 方法，办法
durable ['djuərəbl] *adj.* 耐久的，持久的
steel [sti:l] *n.* 钢的
additive ['æditiv] *n.* 添加剂，附加物
weatherproof ['weðəpru:f] *n.* 防风雨的，不受气候影响的
diagonally [dai'ægənəli] *adv.* 对角地
truss [trʌs] *n.* 托架
lubricated ['lu:brikeitid] *adj.* 加了润滑剂的
counterbalance [,kauntə'bæləns] *vt.* 使平衡
motion ['məuʃən] *n.* 动作，运动
spectacular [spek'tækjulə] *adj.* 壮观的，惊人的
plywood ['plaiwud] *n.* 合板，胶合板
fatally ['feitəli] *adv.* 致命地，致死地

Home Sense: Stronger Glass with a View to Safer Homes

3. 家庭意识：强化玻璃，为了更安全的家

机经选粹

这一篇是关于强化玻璃的。像是个新闻，讲一个地方的玻璃无缘无故崩塌，官员说无所谓，是少现象，科学家却不以为然！然后讲它与普通玻璃的不同以及它的制作过程。

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Home Sense: Stronger Glass with a View to Safer Homes

Half the homes in the country still have windows with single-thickness glass that shatters easily under the impact of a branch or the gloved hand of a burglar. Double-glazing is used in newer homes to save energy. But there are other types of special-purpose glass that can provide extra strength against storm damage and accidental impact, and better protection against forced entry.

Aside from wire-reinforced glass that is used more in commercial buildings than houses, there are two main types of safety glazing: tempered glass that is required by code in many residential locations, and laminated glass—the type used in car windshields that cracks but never really breaks.

Tempered Glass

This heat-treated glass is roughly four times stronger than single-thickness annealed glass because of a manufacturing process that includes cycles of rapid heating and

cooling. Without this treatment, glass can break into large, razor-edged shards. With it, glass crumbles into tiny cubes that are less likely to cause serious injury even though the edges are sharp.

Tempered glass is commonly required by code in several locations: in doors (and within 24 inches of a door edge), in windows within 18 inches of the floor, in shower and bath enclosures, and in any windows or partition panels in a stairway. The pebbling effect also adds a safety margin on glass you might use on top of a desk or coffee table and on glass shelves.

Tempered glass looks as clear as other types of glass; there is no visible reinforcement the way there is in wire glass. But you can identify tempered glass by a small, non-removable specification emblem that is etched into the corner of every tempered pane.

Laminated Glass

This reinforced glass has been used to protect *the Mona Lisa* at the Louvre and *the Declaration of Independence* at the National Archives. It also is designed to protect people inside houses from window blowouts and flying glass generated by hurricane-force winds.

To meet this high-strength standard, laminated glass has survived one of the harshest tests imposed on any building material. It's called the large-missile impact test, conducted by several hurricane-prone counties in southern Florida, in which glazing must withstand penetration by a nine-pound 2-by-4 fired into a window at more than 30 miles per hour.

Laminated glazing is formed from two pieces of glass bonded around a tough plastic interlayer made of polyvinyl butyral. Heat and pressure used in manufacturing makes the laminations look like a single piece of optically clear glass. That's why it works in car windshields and machinist's safety goggles, as well as in windows and doors.

It was invented by accident in 1903 by a French scientist, Edouard Benedictus, who knew he was onto something when he knocked a glass beaker containing celluloid to the floor and the glass did not break. He experimented with a process of heat-sealing celluloid between two pieces of glass and found that the laminated glass sandwich could withstand the blow of a hammer.

During World War I, the U.S. Army used safety glass for lenses in gas masks. But a major market did not emerge for the product until 1914, when cars were fitted with the first version of Benedictus's safety glass.

Laminated glass will break under heavy impact, but the pieces cling to the plastic interlayer, even though a standard pane is only 7/32-inch thick, including the 1/32-inch polyvinyl butyral core. The lamination can be produced using standard annealed glass, which allows it to be easily cut or drilled. But tempered glass can be used to make the sandwich when extraordinary strength is required.

Aside from the strength and safety features, laminated glass dampens sound, blocks ultraviolet light that fades fabrics and wood, and provides increased resistance against burglary. In addition to withstanding a flying 2-by-4, a 1/4-inch-thick piece of laminated glass can pass a standard industry test designed to measure the resistance of exterior glass to forced entry: 10 blows with a ball peen hammer.

Although the plastic core is not particularly effective as an insulator, it can be used with conventional energy—efficient designs, including insulated windows with a gas-filled space and windows with integral Low-E coatings.

It is a good sound damper, although any double-glazing noticeably reduces sound transmission. But an insulated window with two panes of 1/4-inch laminated glass, and a 1/2-inch airspace offers more sound control than a similar window with two panes of standard glass.

It is the best clear glazing by far when it comes to controlling the fading effects of ultraviolet rays. All exterior glass filters out some UV radiation. Two panes of standard glass do better by cutting ultraviolet rays by about 40 percent. The next step up is double-glazing with a Low-E coating, which can reduce UV radiation by 75 percent. With the plastic interlayer in laminated glass, ultraviolet radiation is cut by 95 percent to 99 percent.

According to an independent study by the North American Laminated Glass Information Center, based in St. Louis, a group sponsored by a major supplier of plastic-interlayer material, laminated glass windows add from $ 1,000 to $ 2,000 to the price of the average new home. But you may need the material only for some openings.

参考译文

在这个国家，有半数家庭的窗户仍安装的是薄窗玻璃，这种玻璃在树枝的碰撞或盗贼戴着手套的手的撞击下很容易破碎。新式家庭用双层中空玻璃来保存能量。但是，还有其他一些特殊用途的玻璃，他们可以提供超强的强度去抵抗暴风雨的破坏和意外的撞击，还可以更好地阻止强迫性入侵。

除了相比在家里而常用于商业大楼的夹丝强化玻璃，还有2种主要的安全玻璃：在许多住宅区里的需要密码的钢化玻璃，以及夹层玻璃。夹层玻璃常被用作汽车的挡风玻璃，它会破裂，但从不会真正破碎成片。

钢化玻璃

这种热处理玻璃比薄退火玻璃大约坚固4倍，因为它的制作过程包括了速热和速冷的循环。如果不经过这种处理的话，玻璃会破碎成大块的、带刃的锐口碎片。经过处理后，玻璃会碎裂成微小的立方体，即使边缘很锋利，也很少带来严重的伤害。

在许多场所，钢化玻璃通常都要求有密码，比如说：门上(距门边缘24英尺内)，距地板18英尺内的窗户上，洗澡间的设备上，以及楼梯里任何一个窗户或分隔栏上。卵石纹效果也为玻璃增加了安全界限，这种玻璃可能被用在书桌和咖啡桌的桌面上和玻璃架子上。

钢化玻璃看起来和其他玻璃一样清晰，它不像夹丝玻璃那样会对视觉产生阻碍。但你可以通过每一块强化玻璃角上蚀刻的一个小小的、不可抹去的详细标志将它辨认出来。

夹层玻璃

这种加强型玻璃被用来保护过卢浮宫里的《蒙娜丽莎》和美国国家档案馆里的《独立宣言》。它旨在可以使房子里的人们免受窗户爆裂和飓风冲击造成的玻璃飞屑的侵袭。

为了达到这种高强度标准，夹层玻璃已经经受住了任何建筑材料都要经历的最严格的试验。这种试验叫做大冲击试验，是在佛罗里达州南部的一些易发飓风的县进行的。在这个试验里，夹层玻璃必须抵抗住重9磅，长4米宽2米，以每小时30多英

里的速度射向窗户的飓风的冲击。

夹层玻璃是将2块玻璃通过1块聚乙烯醇缩丁醛制成的强韧的塑料膜黏合制作而成的。在制作过程中要使用热力和压力让夹层看起来像一块透明的单层玻璃。这就是为什么它能用作汽车的挡风玻璃、机械工的安全护目镜和门窗。

夹层玻璃是1903年由一位名叫爱德华·班尼迪克特斯的法国科学家意外发明的。当他把一个含有赛璐珞的玻璃杯摔到地上而杯子竟然没破时，他就知道他发现了什么。他做了实验，把赛璐珞用热量密封在2块玻璃之间，结果发现这种夹层玻璃竟然承受得住锤子的敲打。

一战期间，美国军队就用安全玻璃做了防毒面具的镜片。但直到1914年，当汽车安上安装上班尼迪克特斯安全玻璃的第一款产品时，它的主要市场才被开发。

夹层玻璃在遭受重击时也会破裂，但它的碎片会粘在中间的塑料膜上，即使一块标准的玻璃只有7/32英尺厚，只含有1/32英尺的聚乙烯醇缩丁醛核心部分。夹层玻璃可以用标准的退火玻璃制成，这种玻璃很容易切割或钻孔。但如果需要制造非常坚固的玻璃，也可以使用钢化玻璃做夹层。

除了坚固和安全这2个特点外，夹层玻璃还可以隔音，阻挡使织物和木材褪色的紫外线，以及更有效地防盗。除了能够抵抗长4米宽2米的飞来物冲击，一块1/4英尺的夹层玻璃还能通过一项标准的工业试验，这种试验是用来测试外用玻璃对强迫性入侵的抵挡程度的，方法就是用一个带有球状锤头的锤子敲打玻璃10次。

尽管塑料核心作为一种绝缘体并不特别有效，但它有着传统的优点——有效的设计，包括有充气空间的隔离窗户和整体低辐射塑料薄膜的窗户。

夹层玻璃隔音效果非常好，虽然任何双层中空玻璃都可以很明显地减少声音的传播。但与由2块标准玻璃制成的类似的窗户相比，有着2块1/4英尺夹层玻璃和一个1/2英尺空间的绝缘窗户隔音效果要更好。

在能够抵挡有褪色作用的紫外线的玻璃中，夹层玻璃显然是清晰度最高的玻璃。所有的外用玻璃都会过滤走一部分紫外辐射。双层标准玻璃在这方面要好一些，可以滤走40%的紫外线。更好的就是有低辐射塑料薄膜的双层中空玻璃，可以减少75%的紫外线。而夹层玻璃中间的塑料膜可以把紫外线减少95%~99%。

根据北美夹层玻璃信息中心的一项独立研究来看：夹层玻璃所制的窗户为一般的新家庭增加了1,000~2,000美元的开销。这次研究是以圣路易斯为基地，由一群塑料夹层材料的主要供应商发起的。但也许你只有在某些门上才会用到这种材料。

核心词汇

shatter [ˈʃætə] *vi.* 破碎，打碎
accidental [ˌæksiˈdentl] *adj.* 意外的，偶然的
laminated [ˈlæmineitid] *adj.* 层压的，夹层的
windshield [ˈwindʃiːld] *n.* 挡风玻璃
annealed [əˈniːld] *adj.* 热处理过的，退火的
crumble [ˈkrʌmbl] *vi.* 粉碎，破碎
enclosure [inˈkləuʒə] *n.* 围墙，围围物
shelve [ʃelv] *n.* 架子
reinforcement [ˌriːinˈfɔːsmənt] *n.* 加强，强化
blowout [ˈbləuaut] *n.* 爆裂
withstand [wiðˈstænd] *vt.* 经得起，承受得住
penetration [ˌpeniˈtreiʃən] *n.* 穿透，穿透能力
optically [ˈɔptikəli] *adv.* 光学上
machinist [məˈʃiːnist] *n.* 机械师
celluloid [ˈseljulɔid] *n.* 赛璐珞
lens [lenz] *n.* 镜片
interlayer [ˈintə(ː)ˌleiə] *n.* 夹层
burglary [ˈbəːgləri] *n.* 盗窃行为，破门盗窃
peen [piːn] *n.* 锤头
damper [ˈdæmpə] *n.* 消音器
ultraviolet [ˌʌltrəˈvaiəlit] *adj.* 紫外线的

Aswan Dam

4. 阿斯旺水坝

机经选粹

这一篇是关于阿斯旺水坝修建（埃及尼罗河上的）后造成的后果。原因在于土地流失、流速减慢导致充满淤泥。

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Aswan Dam

Aswan (Assuan) is a city on the first cataract of the Nile in Egypt. Two dams straddle the river at this point: the newer Aswan High Dam *(Arabic: السد العالي; transliterated: as-Sad al-'Aly)*, and the older Aswan Dam or Aswan Low Dam. The aim of this water project was to prevent the river's flooding, generate electricity and provide water for agriculture.

Without impoundment the River Nile would flood each year during summer, as waters from East Africa flowed down the river as they did in ancient times. These floods brought nutrients and minerals that made the soil around the Nile fertile and ideal for farming. As the population along the river grew, there came a need to control the flood waters to protect and support farmland and cotton fields. In a high-water year, the whole crop may be entirely wiped out, while in a low-water year there was widespread drought and famine.

The British began construction of the first dam in 1889. Construction lasted until 1902. It was opened on December 10, 1902. The project was designed by Sir William Willcocks and involved several eminent engineers including Sir Benjamin Baker and Sir John Aird, whose firm, John Aird & Co., was the main contractor. A gravity dam, it was 1,900m long and 54m high. The initial design was soon found to be inadequate and the height of the dam was raised in two phases, 1907 — 1912 and 1929 — 1933.



When the dam almost overflowed in 1946 it was decided that rather than raise the dam a third time, a second dam would be built 6 km upriver (about 4 miles). Proper planning began in 1952, just after the Egyptian Revolution led by the Free Officers, of whom Nasser was to become leader. At first the USA and Britain were to help finance construction with a loan of USD $270 million in return for Nasser's leadership on resolving the Arab-Israeli Conflict. However both nations cancelled the offer in July 1956 as part of the secret US-led "OMEGA" policy to marginalize Nasser. A secret Egyptian arms agreement with Czechoslovakia (Eastern Bloc) and Egyptian recognition of the People's Republic of China are cited as possible reasons.

In 1958, the Soviet Union stepped in and funded the dam project. The Soviets also provided technicians and heavy machinery. The enormous rock and clay dam was designed by the Soviet Hydroproject Institute.

Construction began in 1960. The High Dam, an embankment dam, was completed on July 21, 1970, with the first stage finished in 1964. The reservoir began filling in 1964 while the dam was still under construction and first reached capacity in 1976. The reservoir raised concerns from archaeologists and a rescue operation was begun in 1960 under UNESCO. Sites were to be surveyed and excavated and 24 major monuments were moved to safer locations (see Abu Simbel) or granted to countries that helped with the works (such as the Debod temple in Madrid and the Temple of Dendur in New York).

On the Egyptian side, the project was led by Osman Ahmed Osman's Arab Contractors. The relatively young Osman underbid his only competitor by one-half. Osman complained about the quality of the Soviet-supplied equipment and machinery, and successfully campaigned to have Soviet workers removed from the project. The project made the Arab Contractors, and Osman himself, national icons.

The dam powers twelve generators each rated at 175 megawatts, producing a hydroelectric output of 2.1 gigawatts. Power generation began in 1967. When the dam first reached peak output it produced around half of Egypt's entire electricity production (about 15% by 1998) and allowed for the connection of most Egyptian villages to use electricity for the first time. The dam mitigated the effects of dangerous floods in 1964 and 1973 and of threatening droughts in 1972—1973 and 1983—1984. A new fishing industry has been created around Lake Nasser, though it is struggling due to its distance from any significant markets.

Damming the Nile has caused a number of environmental and cultural issues. It flooded much of lower Nubia and over 90,000 people were displaced. Lake Nasser flooded valuable archaeological sites such as the fort at Buhen. The silt which was deposited in the yearly floods, and made the Nile floodplain fertile, is now held behind

the dam. Silt deposited in the reservoir is lowering the water storage capacity of Lake Nasser. Poor irrigation practices are waterlogging soils and bringing salt to the surface. Mediterranean fishing declined after the dam was finished because nutrients that used to flow down the Nile to the Mediterranean were trapped behind the dam.

There is some erosion of farmland down-river as the river replenishes its sediment load. Erosion of coastline barriers due to lack of new sediments from floods will eventually cause loss of the brackish water lake fishery that is currently the largest source of fish for Egypt, and the subsidence of the Nile Delta will lead to inundation of the northern portion of the delta with seawater, in areas which are now used for rice crops. The delta itself, no longer renewed by Nile silt, has lost much of its fertility. The red-brick construction industry, which used delta mud, is also severely affected. There is significant erosion of coastlines (due to lack of sand, which was once brought by the Nile) all along the eastern Mediterranean.

The increased use of artificial fertilizers in farmland below the dam has caused chemical pollution which the traditional river silt did not. Indifferent irrigation control has also caused some farmland to be damaged by waterlogging and increased salinity, a problem complicated by the reduced flow of the river, which allows salt water to encroach further into the delta.

Mediterranean fish stocks are also negatively affected by the dam. The eastern basin of the Mediterranean is low in fertility, and traditionally the marine ecosystem depended on the rich flow of phosphate and silicates from the Nile outflow. Mediterranean catches decreased by almost half after the dam was constructed. (citation needed) The dam has been implicated in a rise in cases of schistosomiasis (bilharzia), due to the thick plant life that has grown up in Lake Nasser, which hosts the snails who carry the disease.

The Aswan Dam tends to increase the salinity of the Mediterranean Sea, and this affects the Mediterranean's outflow current into the Atlantic Ocean (see Strait of Gibraltar). This current can be traced thousands of kilometers into the Atlantic.

Due to the absence of appreciable rainfall, Egypt's agriculture depends entirely on irrigation. With irrigation, two crops per year can be produced, except for sugar cane that has a growing period of almost one year. The high dam at Aswan releases on average 55 billion m3 water per year of which some 46 billion m3 are diverted into the irrigation canals. In Nile valley and delta, almost 8 million feddan (1 feddan is about 1 acre or 0.42 ha) benefit from these waters producing on average 1.8 crop per year. The annual crop consumptive use is about 38 billion m3. Hence, the overall irrigation efficiency is 38/46 = 0.82 or 82%.

Compared to the efficiency elsewhere in the world this is a high value. The field

irrigation efficiencies are much less, but the losses are re-used downstream. This continuous re-use accounts for the high overall efficiency. The equal distribution of irrigation water over the branch canals taking off from the main irrigation canals leaves to be desired.

Branch canal	*Water delivery in m^3/feddan**
Kafret Nasser	*4,700*
Beni Magdul	*3,500*
El Mansuria	*3,300*
El Hammami upstream	*2,800*
El Hammami downstream	*1,800*
El Shimi	*1,200*

**Period 1 March to 31 July. 1 feddan is about 1 acre or 0.42 ha. Data from Egyptian Water Use Management Project (EWUP)*

The salt concentration of the water in the Aswan reservoir is about 0.25 kg/m3. This is very "sweet" water. At an annual inflow of 55 billion m3, the annual salt import reaches 14 million ton. The average salt concentration of the drainage water evacuated into the sea and the coastal lakes is 2.7 kg/m3 (Egyptian Drainage Research Institute, yearbook 1995/1996). At an annual discharge of 10 billion m3 (not counting the 2 billion m3 of salt intrusion from the sea and the lakes, see figure "Water balances"), the annual salt export reaches 27 million ton. In 1995, the salt export was higher than the import, and Egypt's agricultural lands were desalinizing. Part of this could be due to the large number of subsurface drainage projects executed in the last decades to control the water table and soil salinity.



阿斯旺是埃及尼罗河第一大瀑布下的一座城市。在这里，2座水坝横跨尼罗河：一个是新建的阿斯旺高坝，另一个是旧的阿斯旺水坝或阿斯旺低坝。这项水利工程的建设目的在于防洪、发电和为农田灌溉提供水源。

如果没有水坝将水围住，自古以来每年夏天，当河水从东非顺流而下时，尼罗河里的水就会泛滥。这些洪水带来的养分和矿物质，使尼罗河周围的土壤变得肥沃，成为理想的耕作之地。随着沿河人口数量的不断增长，控制洪水以保护和维持农田及棉田里庄稼的生长就变得势在必行。如果在水位较高的年份，那么所有的庄稼可能会被完全冲毁；而如果

在水位较低的年份，则又会出现大面积的干旱和饥荒。

英国人于1889年开始建设第一座大坝，至1902年竣工，并于1902年12月10日开放使用。该工程由威廉·维尔寇克爵士设计，同时参与的还有其他几位杰出的工程师，如本杰明·贝克爵士和约翰·诶尔德爵士，他们所在的约翰·诶尔德公司则是主要的承包商。这座重力坝长1,900米，高54米，但很快这个坝被发现存在高度上的不足，因此于1907 — 1912年和1929 — 1933年期间两度筑堤加高。

1946年，当水位再度高出警戒线时，人们决定不再第三次加高堤坝，而是在上游6公里(大约4英里)处修建第二座大坝。严格意义上来说，此工程的策划始于1952年，也就是在埃及自由军官领导的埃及七月革命之后，在这次革命中，纳赛尔成为了国家领导人。在纳赛尔的领导下，埃及成功地解决了阿拉伯—以色列的冲突。作为回报，起初英美决定为阿斯旺高坝工程资助2.7亿美元。后来，美国领导了一项秘密政策即“欧米伽”政策，该政策旨在排斥纳赛尔。英美两国于1956年7月取消这次援助计划便是该政策的一部分。与捷克斯洛伐克(东方国家)签订的一项埃及秘密武器协议以及埃及对中华人民共和国的认可都是英美这次撤资的可能原因。

1958年，苏联政府开始参与水坝工程的建设，并为其提供资金，还提供了技术人员及重型机械。这座由巨石和黏土修筑而成的大坝是由苏联水利水电学院设计的。

新水库启建于1960年。这座高坝，也是一座堤防坝，完工于1970年7月21日，它的第一阶段于1964年完成。1964年水库开始蓄水，当时堤坝仍处于建设中。1976年水库蓄水量首次达到水库的容量。新水库引起了考古学家们的关注，1960年联合国教科文组织组建了一次救援活动。他们开始勘测和挖掘适宜建坝的地址，24个主要历史遗迹被迁移到了更为安全的地点重建(如阿布辛贝勒神庙)，或者是将遗迹交给愿意帮助其重建的国家(如将帝伯神庙移交马德里市以及将丹铎神庙移交纽约市)。

在埃及，该工程由奥斯曼·艾哈迈德·奥斯曼的阿拉伯建筑商承办。相对年轻的奥斯曼比他唯一的竞争对手出价低一半。奥斯曼抱怨苏联提供的设备和机械的质量不好，并成功地发起运动让苏联工人撤出这个工程。为此，该工程使得阿拉伯建筑商及奥斯曼本人成为了民族英雄。

大坝为12台功率为175百万瓦特发电机提供动力，水力发电量达21亿瓦特。大坝于1967年开始发电。大坝电量输出首次达到顶峰时，大约半个埃及的全部电力生产都是由它提供的(到1998年大约为15%)，而且它还使得大部分的埃及农村第一次用上了电。大坝还缓解了1964年和1973年的洪涝、1972 — 1973年以及1983 — 1984年的干旱所带来的影响。一种新的渔业在纳赛尔湖周围建立起来，尽管远离所有重要的市场而使其处于挣扎生存的境地。

在尼罗河上筑坝已经引发了很多环境和文化问题。它淹没了地势较低的努比亚的大部分地区，使9万多人流离失所。纳赛尔湖淹没了宝贵的考古遗址，如达布衡的堡垒。每年洪水过后留下的、使尼罗河漫滩土壤变得肥沃的淤泥如今仍然遗留在大坝后面。水库沉积的淤泥降低了纳赛尔湖的蓄水能力。不合理的灌溉方法使得土壤被浸湿，在表面形成了一个盐层。大坝建成后，因过去经尼罗河流往地中海的营养物质都被堵在了大坝后面，所以地中海的渔业不断衰落下去。

因为水库沉积的淤泥越来越多，河下游有一些农田状况恶化。由于缺少洪水带来的新的沉积物，海岸线也在不断受到侵蚀，这最终会使微咸湖渔业遭到损失，而微咸湖渔业却

是现在埃及水产的最大来源。而且尼罗河三角洲的沉积物将使三角洲北部被海水淹没，而其中一些地区是要用来种植水稻作物的。三角洲因为没有尼罗河带来的新的淤泥，土壤失去了往日的肥沃。用三角洲的泥土制造红砖的建筑业也受到了严重影响。(由于尼罗河带来的泥沙量的欠缺)地中海东部海岸线也受到了很大程度的侵蚀。

大坝下游，农田里人工肥料越来越多的使用已造成化学污染，而传统的河流淤泥却不会。对灌溉管理的漠视使得一些耕地被洪水破坏；河流量的下降也带来了一个复杂问题——盐度增加了，这使得三角洲进一步受到了海水的侵蚀。

阿斯旺水坝造成地中海的盐度增加，而且它对从地中海流入大西洋的水流量也有影响(见直布罗陀海峡)，造成成千上万公里的水流流入大西洋。

核心词汇

cataract ['kætərækt] *n.* 大瀑布
straddle ['strædl] *vt.* 横跨，跨立于
impoundment [im'paundmənt] *n.* 蓄水，集水区
widespread ['waidspred] *adj.* 普遍的
famine ['fæmin] *n.* 饥荒
eminent ['eminənt] *adj.* 著名的，杰出的
technician [tek'niʃ(ə)n] *n.* 技术员，技师
enormous [i'nɔ:məs] *adj.* 巨大的
embankment [im'bæŋkmənt] *n.* 堤防，筑堤
underbid [ˌʌndə'bid] *vt.* 以低价提供，叫价低于……
megawatt ['megəwɔt] *n.* 百万瓦特
hydroelectric [ˌhaidrəui'lektrik] *adj.* 水力电气的
gigawatt ['dʒaigəwɔt] *n.* 十亿瓦特
mitigate ['mitigeit] *vt.* 缓和，减轻
replenish [ri'pleniʃ] *vt.* 补充
brackish ['brækiʃ] *adj.* 有盐味的，略咸的
subsidence ['sʌbsidəns] *n.* 沉淀，下沉
delta ['deltə] *n.* (河流的)三角洲
coastline ['kəustlain] *n.* 海岸线
irrigation [ˌiri'geiʃən] *n.* 灌溉
encroach [in'krəutʃ] *vt.* 侵入，侵蚀
salinity [sə'liniti] *n.* 盐分，盐度

Isambard Kingdom Brunel

5. 伊萨姆巴德·金德姆·布鲁内

机经选粹

这一篇讲的是伊桑巴德·金德姆·布鲁内尔(Isambard Kingdom Brunel)（1806年4月9日，朴次茅斯——1859年9月15日，伦敦），他是一名英国工程师，他的贡献主要在于主持修建了大西部铁路（Great Western Railway）、系列蒸汽轮船和众多的重要桥梁。

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Isambard Kingdom Brunel

Isambard Kingdom Brunel (April 9, 1806 — September 15, 1859) was a British engineer, noted for the creation of the Great Western Railway and a series of famous steamships.

The Thames Tunnel

The son of noted engineer Sir Marc Isambard Brunel, Isambard K. Brunel was born in Portsmouth, England on April 9, 1806. His father was working there on the block-making machinery of the Portsmouth Block Mills. The young Brunel was sent to France to be educated at the College of Caen in Normandy and the Lycée Henri-Quatre in Paris. He rose to prominence when, aged 20, he was appointed as the resident engineer of the Thames Tunnel, his father's greatest achievement. The first major river tunnel ever built, Isambard spent nearly two years trying to drive the horizontal shaft from one side to the other. Two severe incidents of flooding injured the younger Brunel and ended work on the tunnel for several years, though it was eventually completed.

The Great Western Railway

In the mean time, Brunel moved on. In 1833 he was appointed engineer of the Great Western Railway, one of the wonders of Victorian Britain. Running from

London to Bristol (and a few years later, to Exeter), the Great Western contained a series of impressive achievements—viaducts, stations, and tunnels—that ignited the imagination of the technically minded Britons of the age. Brunel soon became one of the most famous men in Britain on the back of this interest.

Brunel made the controversial choice of using broad gauge (7 ft 0.25 in or 2.14 m) for the line. According to many railway historians, this was an advantageous choice, not least because it permitted carriages with a width of 10 ft 6 in, significantly wider than those of the railway's competitors; but nonetheless it eventually had to be changed to bring it in line with standard British railway gauge (4 ft 8.5 in or 1.435 m), the last broad gauge rails being converted to standard gauge in 1892.

Brunel's "Atmospheric Caper"

Another of Brunel's interesting though ultimately unsuccessful technical innovations was the atmospheric railway, the extension of the GWR southward from Exeter towards Plymouth (technically the South Devon Railway (SDR), though supported by the GWR). Instead of using locomotives, the trains were moved by Cleggs and Samudas Patent system of atmospheric (vacuum) traction, the evacuation being done by stationary engines at a series of pumping stations. The section from Exeter to Newton (now Newton Abbot) was completed on this principle, and trains ran at approximately 20 miles per hour (32 km/h). 15 inch (381 mm) pipes were used on the level portions, and 22 inch (559 mm) pipes were intended for the steeper gradients. Unfortunately the technology required the use of leather flaps to seal the air pipes, the leather had to be kept supple by the use of tallow, and tallow is attractive to rats; the result was inevitable, and air-powered vacuum service lasted less than a year, from 1847 (experimental services began in September; operationally from February 1848) to September 10, 1848. The accounts of the SDR for 1848 suggest that the atmospheric traction cost 3s 1d per mile (￡0.10/km), compared to 1s 4d (￡0.04/km) for conventional steam power. The pumping station at Starcross, on the estuary of the River Exe, remains as a striking landmark, and a reminder of the atmospheric railway — which is also commemorated in the name of the village pub. A section of the pipe, without the leather covers, is preserved in Didcot Railway Museum.

Transatlantic Shipping

Even before the Great Western Railway was opened, Brunel was moving on to his next project—transatlantic shipping. He used his prestige to convince his railway company employers to build the Great Western, at the time by far the largest steamship in the world. It first sailed in 1837. The Great Britain followed in 1843, and was the first iron-hulled, propeller-driven ship to cross the Atlantic Ocean.

Building on these successes, Brunel turned to a third ship in 1852, even larger than both

of its predecessors. The Great Eastern was cutting edge technology for its time—it was the largest ship ever built until the RMS Lusitania launched in 1906—and it soon ran over budget and over schedule in the face of a series of difficult technical problems. The ship is widely perceived as a white elephant. Though a failure at its original purpose of passenger travel, it eventually found a role as an oceanic telegraph cable-layer.

Bridges

Besides the railway and steam ships, he was also involved in the construction of several lengthy bridges, including the Royal Albert Bridge near Plymouth, and an unusual telescopic bridge in Bridgwater. He also designed the Clifton Suspension Bridge in Bristol, but did not live to see it constructed. His colleagues and admirers in the Institution of Civil Engineers felt the bridge would be a fitting memorial, and started to raise new funds and to amend the design. Work started in 1862, and was complete by 1864, five years after Brunel's death.

Illnesses and Death of Brunel

In 1843, while performing a conjuring trick for the amusement of his children, he accidentally swallowed a half-sovereign coin which became lodged in his windpipe. A special pair of forceps failed to remove it, as did a machine to shake it loose devised by Brunel himself. Eventually, at the suggestion of Sir Marc, Isambard was strapped to a board, turned upside-down, and the coin was jerked free.

Brunel suffered a stroke in 1859, just before the Great Eastern made its first voyage to New York. He died ten days later and is buried, like his father, at Kensal Green Cemetery in London. His son, Henri Marc Brunel, also enjoyed some success as a civil engineer.

Commemorating Brunel

There is an anecdote which states that Box Tunnel on the Great Western railway line is placed such that the sun shines all the way through it on Brunel's birthday. For more information, see the entry on the tunnel.

Many of Brunel's original papers and designs are now held in the Brunel collection at the University of Bristol.

Brunel was included in the top 10 of the 100 Greatest Britons poll conducted by the BBC and voted for by the public. Each of the finalists in the poll was featured in an hour-long documentary. An admiring Jeremy Clarkson wrote and presented the programme about Brunel. In the second round of voting, which concluded on November 24th, 2002, Brunel placed second behind Winston Churchill. There are many monuments and memorials commemorating his achievements in the GWR



area, including a statue at Paddington station, and a collection of streets around St David's station in Exeter, giving access to student residences of the University of Exeter, that bear his names—Isambard Terrace, Kingdom Mews, and Brunel Close. He is also the namesake of Brunel University in West London.

参考译文

伊萨姆巴德·金德姆·布鲁内于1806年4月9日出生于英国的朴次茅斯，他是著名工程师马克·伊萨姆巴德·布鲁内的儿子。他的父亲在朴次茅斯的一家砖厂里从事制造砖块成型机器的工作。布鲁内年轻时曾被送往法国，分别在诺曼底的凯恩大学和巴黎的亨利第四大学接受教育。仅仅在20岁的时候他就已经声名鹊起，被任命为泰晤士隧道的常驻工程师。此隧道也是其父最伟大的成就。伊萨姆巴德花了近2年的时间修建第一条主要河流隧道，努力使水平轴从一端转动到另一端。虽然最后这一工程顺利完成了，但是2次严重的洪水引发的事故让年轻的布鲁内受了伤，导致他在开通隧道的工作中止了几年。

与此同时，布鲁内的事业继续往前发展。1833年他被任命为大西部铁路的工程师。这条铁路是英国维多利亚时期的一大奇迹，它从伦敦一直延伸至布里斯托尔(几年后，又延至埃克塞特)。大西部铁路的修建包括一系列引人注目的非凡成就——高架桥、车站和隧道，这些都激发了那个年代富有技术头脑的英国人的想像力。缘于对这些项目的兴趣，布鲁内不久就成为英国最著名的人物之一。

布鲁内曾做出了一个有争议性的举措，就是在火车线路上使用宽的轨距(7英尺1/4英寸或2.14米)。根据众多铁路历史学家的说法，这一做法颇具优势，最重要的是它使得车厢宽度达到10英尺6英寸，比起其他类的运输工具要宽得多。尽管如此，它最终还是不得不做出改变以符合英国标准的轨距(4英尺8.5英寸或1.435米)，在1892年最后一条宽距轨被改装成标准轨距。

布鲁内的另一创造也引起了人们的兴趣，那就是大气铁路，虽然最终并未成功，但是它革新了技术，向南延伸至大西部铁路——从埃克塞特至普利茅斯（虽然得到了大西部铁路支持，但技术上属于南德文铁路的建造方式）。与以往使用机车技术不同的是，火车由专属于Cleggs & Samudas专利系统的大气(真空)牵引力来推动，这种真空牵引力是通过一系列抽水站的固定引擎抽成真空来实现。从埃克塞特到牛顿(现在的牛顿埃伯特)这一段就是在这一原则的基础上完成的。火车以大约20英里每小时(32千米每小时)的速度行驶。水平部分上用15寸(381毫米)的导管，陡峭的斜坡上用22寸(559毫米)的导管。不幸地是，这一技术需要使用皮革片来密封空气导管，皮革片需要使用动物硬脂以便其能伸屈自如，而动物硬脂很容易引来老鼠，因此结果就是不可避免的了。气动的真空服务技术持续了不到一年的时间，从1847年(9月份试验运行，1848年2月开始正式运作)到1848年9月10日。根据南德文铁路1848年的财务报道，与传统的蒸汽动力装置花费的1先令4美元(相当于0.04英镑每千米)相比，大气牵引力每英里花费3先令1美元(相当于0.10英镑每千米)。位于伊克斯河三角湾处的斯达克洛斯抽水站，现在仍然是一座惊人的里程碑，它是大气铁路的纪念物，并以村庄酒馆的名义命名作为

留念。导管中未被皮革包裹的一段，现在仍然在迪科特铁路博物馆保存。

早在大西部铁路正式启用之际，布鲁内就已经投身于另一项工程——横渡大西洋航运船。他用他的威望说服铁路公司的老板建造——大西方号，在那个时候已经是世界是最大的汽船了，她的处女航是在1837年。之后，“大不列颠号”于1843年始建，这是第一艘横跨大西洋的由铁壳制作、螺旋桨带动的船只。

在取得一系列成功的基础上，布鲁内在1852年又转向建造第三艘船——大东方号，这艘甚至比它的2个前身都要巨大。大东方号使用的是那个时代的前沿技术，直到1906年皇家邮船路易斯安娜号起航之时，它一直是世界上最大的船只。但是在一系列技术难题面前，它的建造成本很快超过了预算，同时超出了其日程安排。这艘船被公众视为无用之物。虽然原本被启用为客运船的原始计划告以失败，但它最终因被用作海洋电报电缆船而拥有一席之地。

除了修建铁路和汽船以外，布鲁内也参予了一些长桥的建造，包括朴次茅斯附近的皇家阿尔伯特桥——位于布里奇沃特的一座不寻常的观景桥。他还设计了位于布里斯托尔的克利夫顿大吊桥，但可惜的是他未能看到这座桥竣工。土木工程师组织中有一些他的同事和崇拜者们认为这座桥是最合适的纪念物，并着手募集资金来改良这个设计。这项工程始于1862年，在布鲁内死后5年即1864年竣工。

有一个趣闻，讲的是在布鲁内生日那一天安置在大西部铁路上的一个盒形的隧道，能保持太阳光连续不断的射入。如果想要得到更多的信息，可以观察隧道的入口处。

布鲁内许多的原始设计图纸现保存在布里斯托尔大学的布鲁内收藏集中。

在英国广播公司进行的由公众投票的“100位最伟大的英国人”民意测验中，布鲁内位居前10位。此票选活动的每一位最终胜利者都会有1个1小时的纪录片，布鲁内的追随者杰里米·克拉克森制作并主持了有关他的节目。在2002年12月24日揭晓的第二轮票选的结果中，布鲁内位居第二位，仅次于英国首相温斯顿·丘吉尔。在大西部铁路地区，有许多用来缅怀布鲁内成就的纪念碑和纪念物，包括帕西顿车站的一座雕像和位于埃克塞特环绕圣·大卫车站的一些街道，这些与布里斯托尔大学里用他名字命名的学生宿舍都有关系——伊萨姆巴德看台、金德姆房屋和布鲁内庭院。而伦敦西部的布鲁内大学也取其名以铭记斯人。

核心词汇

shaft [ʃɑ:ft] *n.* 轴，杆状物
impressive [im'presiv] *adj.* 给人深刻印象的
viaduct ['vaiədʌkt] *n.* 高架桥
ignite [ig'nait] *vt.* 点燃，使兴奋
nonetheless [ˌnʌnðə'les] *adv.* 尽管如此
locomotive [ˌləukə'məutiv] *n.* 火车头，机车
traction ['trækʃən] *n.* 牵引，牵引力
evacuation [iˌvækju'eiʃən] *n.* 撤离，疏散
gradient ['greidiənt] *n.* 倾斜度，坡度
tallow ['tæləu] *n.* 脂，(尤指)动物脂油
estuary ['estjuəri] *n.* 河口，江口
commemorate [kə'meməreit] *vt.* 纪念，庆祝
steamship ['sti:mʃip] *n.* 汽船，轮船
propeller [prə'pelə] *n.* 螺旋桨，推进器
predecessor ['pri:disesə] *n.* 前辈，前任
oceanic [ˌəuʃi'ænik] *adj.* 海洋的，海洋产出的
memorial [mi'mɔ:riəl] *n.* 纪念物
monument ['mɔnjumənt] *n.* 纪念碑
namesake ['neimseik] *n.* 取（某人）名字的人，同名物

Engineering: Feeling Good Vibrations

6. 裂缝检测工程：感觉微妙的振动

机经选粹

这一篇讲的是桥的检测方法。主要说的是用微波测定桥梁的损坏。原来对桥梁损坏的检验只能人工的，现在一帮科学家发明了一种微波探测来检验。然后介绍了微波探测仪具体的工作过程。有一座大桥由于政府正好要拆除，变成了这台仪器的实验性项目，科学家故意破坏了大桥的某些部位来测验其有效性。最后展望了这种机器的应用前景。

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Engineering: Feeling Good Vibrations

Studies of an old bridge across the Rio Grande have helped the development of a test to detect potentially dangerous cracks.

Cracking usually occurs in a bridge structure before it falls, but detecting the ruptures is notoriously time-consuming, and current methods are not always reliable, say the researchers involved in the recent tests.

Charles Farrar and colleagues at the Los Alamos National Laboratory in New Mexico, have suggested a method based on measuring the vibrations in the bridge structure produced when vehicles travel over it. If cracks are present, the frequency of these vibrations changes.

Farrar first studied the vibrations caused when he pounded the 'healthy', but obsolete, bridge with a giant hydraulic shaker. He then made various cuts in the structure and pounded it again. Farrar found, among other things, a straightforward relationship between the frequency of the vibrations and the damage he had caused to the bridge. Because cracks made the bridge more flexible, the frequency became lower. The team is now working on developing a microwave sensor that could detect the frequency of the vibra-

tions and, by comparing readings with previously gathered 'healthy' data, detect cracks in a bridge. An inspector would simply need to pass underneath with a sensor to obtain a reading. If a few sensors were placed at each end, sudden structural damage (indicated by sudden frequency change) could be spotted instantly, possibly averting disaster. In 1993, an Amtrak train ran off a bridge that had just been struck by a barge, killing 47 people. Farrar thinks that the sensors might prevent disasters such as this, by being linked to some kind of alarm.

Before the testing system is commercially applied, the researchers will first ensure that the microwave sensors can pick up small enough cracks—depending on the frequency of testing, it may be necessary to detect apparently insignificant ruptures that may quickly spread.

参考译文

对格兰德河上的一座旧桥的研究促进了一项检测活动的发展。该检测旨在对存在潜在危险的裂缝进行勘察。

从事近期检测工作的研究人员说，在桥梁倒塌之前，通常桥梁结构上会出现裂缝。然而，众所周知，检测这些断裂的地方需要大量时间，而且当前的一些方法总是不可靠。

新墨西哥的美国洛斯阿拉莫斯国家实验室的查尔斯・法拉尔和他的同事提出了一种方法：通过测试交通工具通过桥梁时的振动来判断桥梁是否有裂缝。如果存在裂缝，其振动频率就会改变。

法拉尔首先用超级水力振动器敲打一座完好但陈旧的桥梁来研究它的振动频率，接着在桥身上制造各种各样的裂缝，再次敲打。他发现：跟其他因素相比，是振动频率与给桥梁带来破坏的裂缝有直接的联系。因为裂缝使桥梁更加柔韧，所以振动频率变低了。现在，这支研究队伍正在研制一种可以测试桥梁振动频率的微波感应器。通过对比先前完好的桥梁的振动频率，检测桥梁中的裂缝。检查员只需拿着一个感应器从桥下走过，得到一个数据即可。如果在桥梁的每一端放上几个感应器，就可以立刻检测出结构是否突然毁坏(从振动频率突变可以看出)，就有可能避免灾难的发生。1993年，一辆美铁火车从一座刚被驳船撞击过的桥梁上掉落下去，导致47人遇难。法拉尔认为，这种感应器如果与某种警报相连接，就有可能避免这样的灾难发生。

在这种监测系统商业化前，首先研究人员将确保微波感应器能够检测出足够小的裂缝——根据测试的频率，发现那些似乎很微小但很有可能迅速扩大的裂缝也许是必要的。

核心词汇

potentially [pə'tenʃ(ə)li] *adv.* 潜在地，可能地
vibration [vai'breiʃən] *n.* 颤动，震动
hydraulic [hai'drɔːlik] *adj.* 水压的
straightforward [streit'fɔːwəd] *adj.* 直接的
sensor ['sensə] *n.* 传感器，感应器
structural ['strʌktʃərəl] *adj.* 结构的
rupture ['rʌptʃə(r)] *n.* 裂缝，断裂

Home Clinic; Cooling the House: The Air-Conditioner Is Not the Only Way

7. 家庭诊所：给屋子降温：空调并不是唯一的方式

机经选粹

这一篇文章讲到，通过简单地把墙涂白、装排风扇等就可以降温，说明除空调外，传统方法一样可以降温。

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Home Clinic; Cooling the House: The Air-Conditioner Is Not the Only Way

The recent hot spell has convinced lots of people that air-conditioning is needed for comfortable living indoors. But in many homes the only room that is air-conditioned is the bedroom, which does not help much during the day, and in many others there is no air-conditioning at all.

Fortunately, there are a number of things the homeowner or apartment dweller can do to keep the inside of the house cooler—even if there is no air-conditioning. And in those houses where there is air-conditioning, taking steps such as those described below will help reduce the cost of running the unit or units. The cooler the house, the less the unit will have to run, and the less the electric bill will be.

Bear in mind that a house absorbs heat from the sun during the daytime and that this heat, trapped inside, can keep occupants warm long after the sun goes down and outside temperatures drop.

That is why it is important to keep two things in mind: (1) shade out or reflect away the sun's heat whenever possible; and (2) get rid of the hot air inside the house as soon as the air outside is cooler.

To shade out the heat use awnings, trees and large shrubs as much as possible to keep the sun from hitting walls and windows. To get rid of hot air inside the house use fans where practical after it has cooled down outside.

Make liberal use of portable fans to circulate air on the inside and to draw hot air out after the sun has gone down. Use fans as exhaust fans, blowing hot air out so that cooler air can be drawn in to replace it. Place the fan in front of a window on the opposite side of the room, or in an adjoining room, so that it draws air in through a window near where you are sitting.

If the house does not have one, think about installing a whole-house attic exhaust fan to draw hot air out after the sun has set. Used properly, these fans can often eliminate the need for running air-conditioners. Even when air-conditioners are used, a good attic fan can help cool the house enough to lower operating costs considerably. New fans are more compact and easier than ever to install (you do not have to cut ceiling joists), and they can be controlled by a timer to go on and off at predetermined hours.

Insulation under the roof and in the outside walls is just as valuable in the summer as it is in the winter—except that now it serves to keep heat out instead of in. The same thing holds true for storm sash and double glazing of windows; just as they obstruct the passage of heat from inside to outside in the winter, so too will they slow up the passage of heat from outside to inside. So keep a storm sash on windows that are seldom opened and on windows that are in air-conditioned rooms.

Make sure the attic has vents, or vents and powered fans, to allow hot air to escape and cool air to enter. If not properly ventilated, attics can serve as veritable "heat sinks" that will keep the house hot for hours at night.

Keep blinds or curtains and drapes closed on windows and doors when the sun is shining on them.

In the morning when the house is still cool, close windows to keep cool air inside, and leave them closed for most of the day—unless there is a cooling breeze or unless the temperature outside drops.

Remember that light colors reflect heat away better than dark colors, so when putting on new roof shingles, think about using white or light-colored ones. On flat roofs there are special aluminum-asphalt roof paints you can apply, which do a great job of reflecting heat away. And on flat and shed-type roofs it often helps to sprinkle lightly with water at intervals.

Flat slabs of light-colored concrete—such as patios or driveways—next to the house serve as mirrors that reflect a great deal of the sun's heat up onto the walls and windows of the house. Anything you can

do to shade them or cool them off on hot days will also help to cool the house off. Sprinkling with a lawn sprinkler every hour or two will help in dispersing the heat they give off, as will shading the concrete with trees, large shrubs or an awning.

Window screens and door screens are needed in this part of the country to keep insects out, but many do not realize they can install screening that also shades, and thus keeps out much of the sun's heat. Often called solar screening or shade screening, it is sold in many hardware stores and home centers and is installed just like regular insect screening.

Large expanses of glass can be further insulated against the passage of solar heat by installing a transparent solar film on the glass. Available as a do-it-yourself product, as well as a professionally installed one, the newest materials in this category are available in several tints (silver, gray, smoke, for example) or clear. They are applied to the inside of the glass, using only water to activate the adhesive on the film.

参考译文

最近一段时间的燥热天气让许多人确信：空调是室内舒适生活的必需品。但许多家庭只在卧室安装了空调，这在白天的时候没有多大用处，还有许多家庭甚至连一台空调都没有。

幸运地是，屋主和住宅居民还可以采取很多方法让室内更凉爽——即使屋子里没有空调。在装有空调的房子里，采取以下措施也可以减少运转一台或多台空调的费用。房子越凉快，要开的空调就越少，电费账单也会越少。

记住，白天时房子从太阳那里吸热，这些热量一直滞留在室内，在太阳下山和室外温度下降以后，这些热量还可以长时间让居住者感到闷热。

这就是为什么要记住以下2件事的重要原因：(1)只要有可能，就要使屋外保持荫凉，或者是反射走太阳的热量；(2)一旦室外的空气凉爽一点了，就要把室内的热空气驱散出去。

利用遮阳棚、树和大型灌木来保持屋外的荫凉，驱赶热量，尽可能地防止太阳直接照射墙壁和窗户。当室外凉爽一点后，如果可以的话，用电风扇把室内的热空气赶走。

太阳落山后，尽可能地用便携式风扇循环吹散室内的空气，把热空气赶走。把风扇当作排气扇，排走热空气，以便让更凉爽的空气进来取代它。把风扇放在房间对面的一扇窗户前面，或是一间毗邻的房间里，以至它可以驱使外面的空气通过你所在附近的窗户进来。

如果房子里没有电扇，考虑一下在整栋房子的顶楼安装一个排气风扇，在太阳下山后把热空气排出去。使用得当的话，这些风扇往往可以消除对空调的需要。甚至是当我们使用空调时，一个好的顶楼风扇也足以帮助降低房子的温度，很大程度地减少了运转费用。新式风扇比以前更小巧，更易于安装(你不必切割天花板托梁)，而且可以用定时器控制，按照预先确定的时间打开和关闭。

和在冬天一样，屋顶下和外面墙壁里的隔离材料在夏天也很有用——只是现

在它是被用来隔热而不是保暖。窗户的防风暴窗框和双层玻璃也有着相同的效果，冬天里它们防止热量从室内散到室外，同样，夏天里它们又将减慢热量从室外进入室内。因此，要在很少打开的窗户和装有空调的房间的窗户上安装防风暴窗框。

确保顶楼有通风口，或是排气孔和动力风扇，让热空气溜出，凉空气进入。如果通风不畅，顶楼可能会成为名副其实的“吸热装置”，它会让房子在夜间热上好几个小时。

当太阳照射在窗帘和门帘上时，要把它们拉上。

早上，当屋子还很凉爽的时候，把窗户关上，保持室内凉爽，而且让它们在一天大部分时间里都关着——直到有凉风吹来或是外面降温了。

记住，浅色比深色能够更好地反射热量，因此，在安装新的屋顶板的时候，考虑用白色的或浅色的。在平屋顶上你可以涂上一种特别的填充铝颜料的沥青屋顶涂料，它可以很大程度地反射热量。每隔一段时间往平屋顶和斜屋顶上轻轻地散上一点水，通常也有助散热。

靠近房子的浅色水泥平地，比如露台和车道，就像是许多面镜子，把大量的太阳热量反射到房子的墙壁和窗户上。任何你能采取的给它们遮阳或是让它们凉爽下来的措施同样也有助于让房子变得凉爽。每隔一两个小时就用草地洒水装置洒一次水，将利于驱散它们释放出来的热量，就像是用树、大型灌木和遮阳棚为水泥地挡住阳光一样。

在这个国家的这个地区，需要用纱窗和纱门来防止昆虫进入，但很多人没有意识到，他们也可以安装有遮阳作用的遮挡物来阻隔很多太阳热量。这种遮挡物通常被称作日光罩或荫凉罩，在很多五金店和家居中心都可以买得到，就像平常的防昆虫纱窗一样安装。

宽阔的玻璃区域可以通过在玻璃上安装一层透明的太阳能薄膜达到更好地隔离太阳热量的效果。一个自制的产品，跟专业安装的一样有用，这种新型的材料可以有很多色调(比如说银色、灰色、暗灰色)，也可以是完全透明的。它们被置于玻璃的里层，只需要用水就能活化薄膜里的黏合剂。

核心词汇

air-conditioned ['eəkən,diʃənd] *adj.* 备有空调装置的
fortunately ['fɔ:tʃənətli] *adv.* 幸运地，幸亏
homeowner [,həum'əunə(r)] *n.* 自己拥有住房者，私房屋主
reduce [ri'dju:s] *vt.* 减少，降低
absorb [əb'sɔ:b] *vt.* 吸收
temperature ['tempritʃə(r)] *n.* 温度
reflect [ri'flekt] *vt.* 反应，反射
awning ['ɔ:niŋ] *n.* 雨篷，遮阳篷
shrub [ʃrʌb] *n.* 灌木
portable ['pɔ:təbl] *adj.* 轻便的，手提式的
adjoining [ə'dʒɔiniŋ] *adj.* 毗邻的
attic ['ætik] *n.* 阁楼，顶楼
predetermined [,pri:di'tə:mind] *adj.* 预定的
obstruct [əb'strʌkt] *vt.* 阻碍，妨碍
sash [sæʃ] *n.* 窗框，框格
veritable ['veritəbl] *adj.* 真实的，名副其实的
breeze [bri:z] *n.* 微风
shingle ['ʃiŋgl] *n.* 木瓦，屋顶板
driveway ['draivwei] *n.* 车道
lawn [lɔ:n] *n.* 草地，草坪
sprinkler ['spriŋklə] *n.* 洒水装置，洒水车
insulate ['insjuleit] *vt.* 隔离
adhesive [əd'hi:siv] *n.* 黏性物

A History of British Architecture

8.英国建筑史

机经选粹

这一篇讲的是英国建筑的发展：从罗马人撤出英国一直说到20世纪初。16世纪的英国建筑就不像Medivial那样inward，而是outward；17世纪的英国建筑如何受影响；文章好像是说查理二世吃了败仗什么的，然后欧洲大陆的建筑风格就影响了英国；最后还有20世纪对建筑的commission shifted from individuals to local government authorities。

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A History of British Architecture

From the Middle Ages to the 20th century, what are the influences and movements that have shaped the changing face of British architecture?

The Middle Ages—1066 and All That

Architecture is about evolution, not revolution. It used to be thought that once the Romans pulled out of Britain in the fifth century, their elegant villas, carefully-planned towns and engineering marvels like Hadrian's Wall simply fell into decay as British culture was plunged into the Dark Ages. It took the Norman Conquest of 1066 to bring back the light, and the Gothic cathedral-builders of the Middle Ages played an important part in the revival of British culture.

"The great cathedrals and parish churches that lifted up their towers to heaven were acts of devotion in stone..."

However, the truth is not as simple as that. Romano-British culture that included architecture along with language, religion, political organisation and the arts—survived long after the Roman withdrawal. And although the Anglo-Saxons had a sophisticated building style of their own, little survives to bear witness to their achievements as the vast majority of Anglo-Saxon buildings were made of wood.

Even so, the period between the Norman landing at Pevensey in 1066 and the day in 1485 when Richard III lost his horse and his

head at Bosworth, ushering in the Tudors and the Early Modern period, marks a rare flowering of British building. And it is all the more remarkable because the underlying ethos of medieval architecture was 'fitness for purpose'. *The great cathedrals and parish churches that lifted up their towers to heaven were not only acts of devotion in stone; they were also fiercely functional buildings. Castles served their particular purpose and their battlements and turrets were for use rather than ornament. The rambling manor houses of the later Middle Ages, however, were primarily homes, their owners achieving respect and maintaining status by their hospitality and good lordship rather than the grandeur of their buildings.*

Fitness for purpose also characterised the homes of the poorer classes. Such people didn't matter very much to the ruling elite and so neither did their houses. These were dark, primitive structures of one or two rooms, usually with crude timber frames, low walls and thatched roofs. They weren't built to last. And they didn't.

Buildings of the Middle Ages

White Tower, at the heart of the Tower of London, was begun by Bishop Gundulf in 1078 on the orders of William the Conqueror. The structure was completed in 1097, providing a colonial stronghold and a powerful symbol of Norman domination.

Durham Cathedral was begun by Bishop William de St Carilef in 1093 and completed about 1175. The choir was extended in the Gothic style between 1242 and 1280. Muscular pillars and round—headed arches make Durham one of the most imposing Norman buildings in England.

Haddon Hall, Derbyshire, was probably begun in the 12th century, but was remodelled and adapted at various times right through to the 16th century. It was then carefully restored in the early 20th century. Haddon shows the quality which characterises the great medieval house, in which function dictates form.

King's College Chapel, Cambridge, spans the period of transition between the Middle Ages and the Tudors. Its foundation stone was laid in 1446 by Henry VI and the structure, with its lacy perpendicular fan-vaulting, was completed by 1515 during the reign of Henry VIII. The windows were installed in 1546—1547.

The Tudors—Stately and Curious Workmanship

In a sense, the buildings of the 16th century were also governed by fitness for purpose—only now, the purpose was very different. In domestic architecture, in particular, buildings were used to display status and wealth. *as William Harrison noted in his Description of England (1577):*

Each one desireth to set his house aloft on the hill, to be seen afar off, and cast forth his beams of stately and curious workmanship into every quarter of the country.

This stately and curious workmanship showed itself in various ways. A greater sense of security led to more outward-looking buildings, as opposed to the medieval arrangement where the need for defence created houses that faced inward onto a courtyard or series of courtyards. This allowed for much more in the way of exterior ornament. *The rooms themselves tended to be bigger and lighter—as an expensive commodity, the use of great expanses of glass*

was in itself a statement of wealth. There was also a general move towards balanced and symmetrical exteriors with central entrances.

"In spite of this building boom the Renaissance was generally slow to arrive in England..."

In addition there was progress towards more stable and sophisticated houses for those lower down the social scale. Stone, and later brick, began to replace timber as the standard building material for the homes of farmers, tradespeople and artisans. *To quote Harrison again:*

Every man almost is a builder, and he that hath bought any small parcel of ground, be it never so little, will not be quiet till he have pulled down the old house (if any were there standing) and set up a new after his own device.

In spite of this building boom the Renaissance was generally slow to arrive in England, largely because Elizabeth's troublesome relations with Catholic Europe made the free exchange of ideas difficult. *Craftsmen and pattern-books did come over from the Protestant Low Countries, but by and large our relative isolation from the European cultural mainstream led to a national style which was a bizarre though attractive mixture of Gothic and classical styles.*

Tudor Palaces and Houses

Hampton Court Palace (1515 onwards). The great house that Cardinal Wolsey began and then gave to Henry VIII in 1525, in a desperate attempt to stay in the King's favour, has undergone many changes since the 16th century. Christopher Wren rebuilt the south and east ranges for William and Mary between 1689 and 1694, and the Palace contains some remarkable Tudor work, notably Henry VIII's hammer-beamed Great Hall.

Longleat House, Wiltshire, which was completed in 1580, exemplifies the confidence of Tudor craftsmen in a society that was more stable than that of their medieval ancestors. It looks outwards rather than in on itself, whilst classical detailing such as the pilasters that flank the expanses of glass, and the roundels carved with busts of Roman emperors, show that Renaissance ideas were creeping slowly into Britain during the mid 16th century.

Hardwick Hall, Derbyshire. This is the archetypal late-Elizabethan house: tall, compact and beautiful. It was designed, probably by Robert Smythson, for Elizabeth, Countess of Shrewsbury who was better known as Bess of Hardwick. Her descendants, the Dukes of Devonshire, made Chatsworth their principal seat, and left Hardwick more or less unscathed. A remarkable survival.

Whilst Elizabethan houses in England concentrated on the conspicuous display of wealth, Scotland saw the building of castles and fortified houses continue well into the seventeenth century. In fact, fortification became a style in its own right, and the turrets and strongly vertical emphases of Scottish Baronial houses mark one of Scotland's most distinctive contributions to British architecture.

Styles of the 17th Century—a World Turned Upside Down

With the exception of Inigo Jones (1573—1652), whose confident handling of classical detail and proportion set him apart from all other architects of the period, most early 17th century buildings tended to take the innocent



exuberance of late Tudor work one step further. *Traditional planning was cloaked in the splendidly overblown ornament—the sort of details described at the time as 'a heap of craziness of decorations...very disgusting to see'.*

But during the 1640s and 50s the Civil War and its aftermath sent many gentlemen and nobles to the Continent either to escape the fighting or, when the war was lost, to follow Charles II into exile. There they came into contact with French, Dutch and Italian architecture and, with Charles's restoration in 1660, there was a flurry of building activity as royalists reclaimed their property and built themselves houses reflecting the latest European trends.

"The style is heavy and rich, sometimes overblown and melodramatic."

As the century wore on, this resolved itself into a passion for the Baroque grandeur which Louis XIV had turned into an instrument of statecraft at Versailles. *Formal, geometrical and symmetrical planning meant that a great lord could sit in his dining chamber, at the physical as well as the metaphorical centre of his world, with suites of rooms radiating out in straight lines to either side. His gardens would reflect those lines in long, straight walks and avenues.*

The British Baroque was a reassertion of authority, an expression of absolutist ideology by men who remembered a world turned upside down during the Civil War. The style is heavy and rich, sometimes overblown and melodramatic. The politics which underpin it are questionable, but its products are breathtaking.

Buildings of the 17th Century

The Queens House, Greenwich, was begun for Queen Anne between 1616 and 1619 and completed for Henrietta Maria between 1630 and 1635. Greenwich Hospital was built from 1696 onwards. The Queens House is by Inigo Jones and the Hospital is largely Christopher Wren's.

St Paul's Cathedral, London, (1675—1710) is not only one of the most perfect expressions of the English Baroque, but also one of the greatest buildings anywhere in England. It was designed by Wren to replace the old cathedral which had been devastated during the Fire of London in 1666.

Although built in the 18th century, the ideology behind Blenheim Palace in Oxfordshire lies firmly in the 17th century. Conceived as a monumental homage to the Duke of Marlborough, whose victory over Louis XIV's army at Blenheim in Bavaria gives the palace its name, it was designed by John Vanbrugh and is the nearest thing Britain has to a Versailles

Styles of the 18th Century—Rules Cramp the Genius

To the Whigs who came to power on the accession of George I in 1714, the Baroque was inextricably linked with the authoritarian rule of the Stuarts. A new style was needed for a new age, and the new ruling class, which aspired to build a civilisation that would rival that of ancient Rome, looked for a solution in antiquity.

Or so it thought. Actually, the solution was found in an antiquity which had been heavily re-interpreted by the 16th century Italian architect Andrea Palladio. Palladio's Four Books of Architecture methodically explored and reconstructed the buildings of ancient

Rome. They also provided illustrations, in the form of its author's own designs for villas, palaces and churches, of a way in which the early Georgians might adapt those rules to create an architecture of the classical tradition—the yardstick by which all civilised activity was measured.

"By the end of the 18th century, the idea of a single national style of architecture had had its day."

But architects soon found the Palladian search for an ideal architecture pointlessly limiting. Whilst the buildings of the ancients should 'serve as models which we should imitate, and as standards by which we ought to judge', a more eclectic approach was called for. In the words of the later 18th century's greatest architect, Robert Adam, 'Rules often cramp the genius and circumscribe the idea of the master'.

By the end of the 18th century, the idea of a single national style of architecture had had its day. Austere neo-classical masterpieces were still being produced; but so too were huge mock-abbeys, battlemented castles, picturesque sixteen-bedroomed cottages and even, as the 19th century dawned, oriental palaces such as John Nash's Royal Pavilion at Brighton. *The Cult of Styles had arrived.*

Buildings of the 18th Century

Loosely modelled on Palladio's Villa Capra, Lord Burlington's Chiswick House was one of the first shots fired in the war waged by the Georgians against the Baroque. In case anyone was slow to appreciate where Burlington's architectural allegiances lay, he had Michael Rysbrack design two statues to flank the entrance stair with Palladio on the left, and his earliest English disciple Inigo Jones on the right.

Kedleston Hall, Derbyshire (1758—77), is a high point of British neo-classicism. The Palladian layout had already been established when the up-and-coming Scottish architect Robert Adam was asked to take over the project in 1760 by the owner, Sir Nathaniel Curzon. The austere, delicate interiors, with their remarkably unified decoration, show Adam at the height of his powers. Kedleston, the Glory of Derbyshire, was one of the most consistently praised of all Georgian houses.

"I am going to build a little Gothic castle at Strawberry Hill," announced Horace Walpole in 1750. Over the next three decades Walpole transformed the uninteresting villa he had bought by the Thames at Twickenham into one of the landmarks of the Gothic Revival in Britain. Strawberry Hill aroused enormous interest—Walpole had to issue tickets to restrict the number of visitors coming to see it—and demonstrated that native medieval architecture could be every bit as valid as classicism.

Victorian Times—Merry England

In the early 19th century, the French Revolution was recent enough to provide an awful example of what might happen if the upper classes lost control, whilst Peterloo and demonstrations against the Six Acts in 1819 were a reminder that it could happen here. The building classes took refuge in a fictitious past, such as the Middle Ages of Walter Scott's Ivanhoe (1819) or the romantic Elizabethan style of Kenilworth (1821). The myth of Merry England, with its strictly ordered society and its chivalric code of values, had a strong appeal for a ruling

elite which felt under threat from social and political unrest at home and abroad.

"...reformers like John Ruskin and William Morris made a concerted effort to return to hand-crafted, pre-industrial manufacturing techniques."

The huge glass-and-iron Crystal Palace, designed by Joseph Paxton to house the Great Exhibition of 1851, shows another strand to 19th century architecture—one which embraced new industrial processes. But it wasn't long before even this confidence in progress came to be regarded with suspicion. *Mass production resulted in buildings and furnishings that were too perfect, as the individual craftsman no longer had a major role in their creation.*

Railing against the dehumanising effects of industrialisation, reformers like John Ruskin and William Morris made a concerted effort to return to hand-crafted, pre-industrial manufacturing techniques. *Morris's influence grew from the production of furniture and textiles, until by the 1880s a generation of principled young architects was following his call for good, honest construction.*

Victorian Buildings

The Houses of Parliament (Charles Barry and A.W.N. Pugin) replaced the building destroyed by fire in 1834. A good example of the period's confused love affair with the past, it was summed up earlier this century as classic in inspiration, Gothic in detailing, and carried out with scrupulous adherence to the architectural detail of the Tudor period.

With its quiet, unassuming love for the vernacular of Kent and Sussex, and its rejection of Victorian pomposity, Philip Webb's Red House at Bexleyheath (1859—60) is the building which started the Arts and Crafts movement. It was originally designed for newly-weds William and Janey Morris.

Castell Coch, near Cardiff, is a piece of inspired lunacy by William Burges, best known for his restoration of Cardiff Castle, an opium habit and the fact that he used to relax at home with a pet parrot perched on the shoulder of his hooded medieval robe. This reconstruction of a 13th century chieftain's stronghold—right down to the working portcullis—is scholarly, at least as far as the exterior is concerned. The interior is downright weird, combining High Victorian romanticism with Burges' own eclectic drawings from ancient British history, Moorish design and classical mythology.

Charles Rennie Mackintosh's Glasgow School of Art proves that there were a few dissenting voices raised against the Victorian trend to return to the past. Mackintosh was uncompromising in his rejection of historicism, and his buildings have more in common with the vertical geometry and sinuous curves of Art Nouveau work in France, Belgium and Austria. But his decadent approach to design met with hostility in Britain and, a few years after the School of Art was completed in 1909, he gave up architecture.

Styles of the 20th Century—Conservatism and Change

The most important trends in early 20th century architecture simply passed Britain by. Whilst Gropius was working on cold, hard expanses of glass, and Le Corbusier

was experimenting with the use of reinforced concrete frames, we had staid establishment architects like Edwin Lutyens producing Neo-Georgian and Renaissance country houses for an outmoded landed class. In addition there were slightly batty architect-craftsmen, the heirs of William Morris, still trying to turn the clock back to before the Industrial Revolution by making chairs and spurning new technology. *Only a handful of Modern Movement buildings of any real merit were produced here during the 1920s and 1930s, and most of these were the work of foreign architects such as Serge Chermayeff, Berthold Lubetkin and Erno Goldfinger who had settled in this country.*

"Local authorities, charged with the task of rebuilding city centres, became important patrons of architecture."

After the Second World War the situation began to change. *The Modern Movement's belief in progress and the future struck a chord with the mood of post-war Britain and, as reconstruction began under Attlee's Labour government in 1945, there was a desperate need for cheap housing which could be produced quickly.* The use of prefabricated elements, metal frames, concrete cladding and the absence of decoration—all of which had been embraced by Modernists abroad and viewed with suspicion by the British—were adopted to varying degrees for housing developments and schools. Local authorities, charged with the task of rebuilding city centres, became important patrons of architecture. This represented a shift away from the private individuals who had dominated the architectural scene for centuries.

Since the War it has been corporate bodies like these local authorities, together with national and multinational companies, and large educational institutions, which have dominated British architecture. By the late 1980s the Modern Movement, unfairly blamed for the social experiments implicit in high-rise housing, had lost out to irony and spectacle in the shape of post-modernism, with its cheerful borrowings from anywhere and any period. But now, in the new Millennium, even post-modernism is showing signs of age. What comes next? Post-post-modernism?

Buildings of the 20th Century

Cardiff's imposing Civic Centre is a vast complex including a City Hall and Law Courts by Lanchester & Richards, and the University College by W D Caro?. It was hailed as one of the most magnificent examples of civic planning in Britain but, in retrospect, its deeply conservative architecture also seems both arrogant and strangely out of touch with contemporary building in the rest of Europe.

The De le Warr Pavilion at Bexhill-on-Sea, Sussex, is a superb expression of all that is best about the Modern Movement. Commissioned by Lord De La Warr, mayor of Bexhill, and built by Eric Mendelsohn and Serge Chermayeff between 1933 and 1936, it was an attempt to make Bexhill as attractive as exotic French and Italian resorts. It goes without saying that it failed, but the recent restoration of the Pavilion's clean, sweeping lines is a cause for national celebration.

The Royal Festival Hall (Sir Leslie Martin and the Architecture Department of the London County Council, 1951) is all that

survives of the complex laid out on London's South Bank for the 1951 Festival of Britain. The festival buildings were important for the opportunity they afforded of presenting a showcase for good modern architecture and Martin's concert hall, while not exactly earth-shattering, is a timely reminder of what good festival architecture looks like.



建筑是逐渐演变的而非彻底改变的。人们一直认为，5世纪罗马人一从英国撤出，他们精致的住宅、布局巧妙的小镇、以及建筑奇迹如哈德良城墙，就开始衰败，此时英国文化陷入了黑暗时代。1066年诺曼征服使其重放光彩。中世纪哥特式大教堂的建造者们在英国文化复兴中扮演十分重要的角色。

然而，事实并非如此简单。包括建筑、语言、宗教、政治组织体系和文学艺术在内的罗马一不列颠文化，在罗马人撤退后仍维持了很长时间。尽管盎格鲁——萨克森人拥有自己独特、精致的建筑风格，但是因为其大多数的建筑物都是以木材为建筑材料，所以很少能够保存下来让人们见证到其建筑成就。

即使如此，自1066年罗马人在佩文西的诺曼底登陆到1485年理查德三世在波斯沃斯失足坠马而最终丢掉性命的这一段时间，开创了都铎王朝和早期现代社会的建筑风格，这段时期的建筑是英国建筑史上一朵奇葩。在所有建筑中，它更为引人注目是因为其中世纪建筑的基本风格——实用性。

在某种意义上，16世纪的建筑也同样受实用性的影响，只是现在它的用途却大相径庭。尤其是住宅建筑，通常用来彰显社会地位以及财富。

这种富丽堂皇、新颖的建筑手艺在许多方面都得到了充分的展示。由于安全意识的提高，更加注重外部装饰的建筑物应运而生，与中世纪强调防御性用途的建筑布局形成强烈反差。在中世纪建筑面朝中央庭院或是一系列的庭院。这就要在室外装饰方面考虑更多。

此外，对于那些社会等级较低的人来说，他们更倾向于那些更稳固、精致的房子。石块以及后来出现的砖块渐渐取代木材成为农民、商人和工匠建造家宅时使用的标准建筑材料。

尽管这种建筑发展迅速，但总体而言，文艺复兴较晚才传到英国，主要是因为伊丽莎白女王与天主教欧洲国家的关系紧张，使得思想的自由交流十分困难。

除了伊尼哥·琼斯(1573—1652年)，17世纪早期的大多数建筑师更倾向于进一步采用都铎王朝末期简洁的建筑风格。而伊尼哥·琼斯在运用古典细节和比例处理方面游刃有余，这使他有别于同一时期的其他建筑师。

随着这个世纪结束，促使了富丽堂皇的巴洛克风格成为一种狂热的时尚，路易十四将巴洛克风格转化成为凡尔赛宫中的一种建筑手段。

英国巴洛克式风格极力推崇权力，也是绝对论主义者意识形态的一种表达，他们铭记了内战时期整个英国的一片混乱。这种建筑风格凝重而且奢华，有时运用繁

复的装饰和夸张的手法。支持这种风格的政治策略是值得怀疑的，但是其成果却是令人叹为观止的。

辉格党在1714年乔治一世登基时掌控大权，巴洛克建筑风格与斯图亚特王室的极权统治密不可分。一种新的建筑风格在新时代应运而生，新的统治阶级在古代建筑物中寻找解决方法，他们渴望建立一个和古代罗马相媲美的文明世界。

18世纪末，采用单一的民族建筑风格的观念已经盛极一时。人们仍然不断建造简单朴素的新古典主义的建筑物，但壮丽的仿修道院建筑、有城垛的城堡、风景怡人的有16间卧室的别墅也同样层出不穷。甚至是在19世纪初，出现了具有东方色彩的宫殿建筑，如建筑师约翰·纳什在布赖顿建造的英皇阁。

建筑师约瑟夫·帕克斯顿以玻璃和钢铁为主要建筑材料的巨大水晶宫殿展示了19世纪建筑风格的另一面——新工业革命时代的象征物。该水晶宫曾承办过1851年世界博览会。但是不久后，人们对逐渐膨胀的信心产生了怀疑。

改革运动者，如约翰·罗斯金和威廉·莫里斯，抵抗工业化中人性丧失的因素的影响，他们一起努力振兴传统手工艺以及工业化前的制造工艺技术。

20世纪初建筑界最主流的建筑趋势传到英国。怀斯特·格罗皮乌斯大量使用冰冷坚硬的玻璃材质，而柯勒彦则大胆尝试钢筋混凝土结构。我们也有一些牢固建筑物，如埃德温·鲁琴斯为一些守旧的地主阶级建造的赋有新乔治亚风尚和文化复兴田园风格的庄邸。此外，还有一些使人略感古怪的建筑师，如威廉·莫里斯的衣钵继承者们仍然试图用制造椅子和摒弃新技术的方式回到工业革命之前的那个年代。

第二次世界大战之后形势开始发生变化。采纳使用预制构件材料、钢筋结构、混凝土覆层和不装修的方式来改变开发房产和建造学校的程度。而所有这些形式受到外国现代主义者的大力推崇，却遭到英国人的质疑。地方政府担负执行重建城市中心的任务，成为建筑的主要赞助人。这表明几个世纪来，个人掌控建筑风貌的格局已发生改变。

核心词汇

architecture [ˈɑːkitektʃə] *n.* 建筑，建筑业
villa [ˈvilə] *n.* 别墅，住宅
withdrawal [wiðˈdrɔːəl] *n.* 撤退，退回
ethos [ˈiːθɔs] *n.* 社会思潮，特质
courtyard [ˈkɔːtjɑːd] *n.* 庭院，院子
ornament [ˈɔːnəmənt] *n.* 装饰，装饰物
tradespeople [ˈtreidspiːpl] *n.* 商人
exuberance [igˈzjuːbərəns] *n.* 茂盛，丰富
statecraft [ˈsteitkrɑːft] *n.* 治国本领
reassertion [riəˈsəːʃən] *n.* 再主张
absolutist [ˈæbsəluːtist] *n.* 专制主义者，绝对论者
ideology [ˌaidiˈɔlədʒi] *n.* 观念学，意识形态
melodramatic [ˌmeləudrəˈmætik] *n.* 戏剧似的夸张手法
inextricably [inˈekstrikəbli] *adv.* 分不开地
antiquity [ænˈtikwiti] *n.* 古建筑，古物，古迹
abbey [ˈæbi] *n.* 修道院
dehumanising [diːˈhjuːmənaiziŋ] *adj.* 失掉人性的，非人性的
spurn [spəːn] *vt.* 拒绝，摈弃
prefabricated [priːˈfæbrikeit] *adj.* 预先制造的，预铸的

Why Pagodas Don't Fall Down

9. 宝塔不倒之谜

机经选粹

这一篇文章开始说日本塔在1,400年里仅有2座倒塌。日本人自己也不解在这个环境恶劣、时有地震和台风的岛国为何还有如此的建筑。起先不知早期建筑技术的精髓，后发现并应用于现代建筑。

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Why Pagodas Don't Fall Down

Kyoto

These Japanese treasures look ready to topple at the first tremor, yet they stand firm when all collapses around them. What's the trick?

In a land swept by typhoons and shaken by earthquakes, how have Japan's tallest and seemingly flimsiest old buildings—500 or so wooden pagodas—remained standing for centuries? Records show that only two have collapsed during the past 1,400 years. Those that have disappeared—and many have—were destroyed by fire as a result of lightning or civil war. The disastrous Hanshin earthquake in 1995 killed 6,400 people, toppled elevated highways, flattened office blocks and devastated the port area of Kobe. Yet it left the magnificent five-storey pagoda at the Toji Temple in nearby Kyoto unscathed, though it levelled a number of lower buildings in the neighbourhood.

Japanese scholars have been mystified for ages about why these tall, slender buildings are so stable. In earthquake-jittery Japan, it was only 30 years ago that the building industry felt confident enough to erect office blocks of steel and reinforced

concrete that had more than a dozen floors. With its special shock absorbers to dampen sudden sideways movements from an earthquake, the 36-storey Kasumigaseki building in central Tokyo—Japan's first skyscraper—was considered a masterpiece of seismic engineering when built in 1968.

Yet in 826, with only pegs and wedges to keep his wooden structure upright, the master builder Kobodaishi had no hesitation in sending his majestic Toji pagoda soaring 55 metres (180ft) into the sky—nearly half as high as the Kasumigaseki skyscraper built some 11 centuries later. Though it burned down four times after being struck by lightning, the latest version of Kobodaishi's classic structure has stood its ground since 1644. The slightly smaller Horyuji pagoda in nearby Nara, originally built in 607, is considered the oldest multi-storey wooden structure in the world. Clearly, Japanese carpenters of the day knew a few tricks about allowing a building to sway and settle itself rather than fight nature's forces and lose disastrously. But what sort of tricks?

No Stairs, No Lifts

The multi-storey pagoda came to Japan from China in the sixth century, with the introduction of Buddhism. The Chinese built their pagodas mainly in stone, with inner staircases, and used them as much as watch-towers as for worship. In Japan, however, the architecture was freely adapted to meet the local conditions.

The Japanese stuck with wood—and they saw no reason to clutter the design with an inner staircase. The upper floors of a Japanese pagoda serve no practical purpose. Often, in fact, there are not even stairs to them. According to Atsushi Ueda, a professor of architecture at Kyoto Seika College, "the Japanese pagoda has evolved from an observation tower to a tower that is itself observed—a kind of objet d'art."

Earthquakes aside, the biggest difference between the Japanese archipelago and the mainland to the north-west is the amount of rainfall. Each summer, the Japanese islands get battered by a couple of dozen typhoons that swirl up from the Philippines. Having to cope with more than twice the annual rainfall of China, Japanese builders have long learned to extend the eaves of their buildings much further out from the walls. This prevents rainwater from gushing down the walls and into the foundations, softening the soil and causing the building eventually to subside or even collapse. Pagodas in China and Korea have nothing like the overhang that is found on pagodas in Japan.

Using a novel arrangement of staggered, cantilevered beams to prop up the eaves, the roof of a Japanese temple building can be made to overhang the sides of the structure by 50% or more of the building's overall width (see chart). A bonus is that the successive cantilevering causes the slope of the roof to become progressively



shallower from the centre out, creating the gentle "catenary" roof line that is unique to traditional buildings in Japan. Many Japanese find this a particularly pleasing shape, reminding them of Mount Fuji's sloping sides or the drooping branches of a matsu pine tree.

Slippery like a Snake

So far, so sensible. But why the resilience? Is the answer that, like a tall pine tree, the Japanese pagoda—with its massive trunk-like central pillar known as a shin-ba-shi-ra—simply flexes and sways when riding out a typhoon or an earthquake? For centuries, many thought so. But the answer is not so simple.

A number of things ensure that a pagoda works nothing like a pine tree. The most startling one is that the trunk-like shinbashira carries no load at all. In some pagoda designs, it does not even rest on the ground, but is suspended from the top of the pagoda—hanging loosely in a well down through the middle of the building. The weight of the building is supported entirely by 12 stout outer columns, which form the square perimeter of the building, plus four inner columns at the corners of a smaller, inner square.

Another bizarre feature of the pagoda is that, because the building tapers, with each successive square floor-plan being smaller than the one below, none of the vertical pillars that carry the weight of the building is connected to its corresponding pillar above. In other words, a five-storey pagoda contains not even one pillar that travels right up through the building to carry the structural loads from the top to the bottom. Such a design would not be permitted under Japan's current building codes. Wooden buildings with two or three storeys today must have through-pillars connecting the roof firmly to the foundations.

A third peculiarity about Japanese pagodas is that the wide eaves that overhang their individual storeys are deliberately loaded down with heavy earthenware tiles. If they were branches of a tree weighed down with snow, they would be torn from the trunk in the first breeze. It would be an easy matter to make the eaves much lighter—by using, say, wooden shingles instead of tiles. So the weight as well as the size of the eaves must be a clue to the pagoda's ability to survive.

Another feature that makes a pagoda unlike a tree is that, curiouser and curiouser, its individual storeys are not actually attached to one another. They are simply stacked one on top of another like a pile of hats. What joints there are between the floors are loosely fitting wooden brackets that allow each storey to slither around.

One further oddity needs resolving before one can pinpoint the source of the pagoda's stability. Put simply, if the shinbashira plays no structural role, what on earth

does it actually do? It is by far the largest piece of timber in the building. And being made from the straightest of the straight-grained hinoki tree (Japanese cypress), it is a formidably expensive piece of wood. It cannot be simply to support the "finial"—the nine-ring ornament and sacred jewel that adorns the top of a pagoda. There are far easier ways of attaching a decorative spire to the top of a building.

More telling still, the shinbashira is strictly a Japanese invention. It is not found in pagodas elsewhere. So now we have the last—and most significant—clue to the mystery of the Japanese pagoda.

Pendulum without a Swing

The best way to understand the shin-ba-shira's role is to watch a video made by Shuzo Ishida, a structural engineer at Kyoto Institute of Technology. Mr Ishida, known to his students as "Professor Pagoda" because of his abiding passion to understand the building's unique dynamics, has built a series of models and tested them on a shake-table in his laboratory.

Some of Mr Ishida's model pagodas have a simulated shinbashira attached to the ground, as was common in pagodas built during the sixth to eighth centuries. Others simulate later designs with the shin-ba-shira resting on a beam on the second floor or suspended from the fifth. Compared with a model with no shin-ba-shira at all, Mr Ishida finds that the one with a central column anchored to the ground survives longest, and is at least twice as strong as any other shin-ba-shira arrangement.

What the early craftsmen had found by trial and error was that, given a hefty sideways shove, a pagoda's loose stack of individual floors co made to slither sideways to and fro independent of one another. Viewed from the side, the pagoda appeared to being doing a snake dance with each consecutive floor moving in the opposite direction to the ones immediately above and below. But if a big fat shinbashira ran up through a hole in the centre of the building like a very loosely tightened bolt, each storey would then be constrained from swinging too far in any direction by banging internally against this central fixture. Better still, each time a storey collided internally with the shin-ba-shira, it would dump some of its energy into the massive central pillar, which could then disperse it safely into the ground.

In short, the shinbashira was acting like an enormous stationary pendulum, which the puny shoves from the separately oscillating floors were futilely trying to make swing. Though they had none of the mathematics, the ancient craftsmen seemed to have an innate grasp of the principles behind wh is known as "tuned mass damping". This is the mechanism which allows the Kasumigaseki building to ride out a violent earthquake.

And what of the extra-wide eaves with their heavy tiles? Think of them as a tightrope walker's balancing pole. Because of inertial effects, the bigger the mass at each end of the pole, the easier it is for the tightrope walker to maintain his balance. The same holds true for a pagoda. "With the eaves extending out on all sides like balancing poles," says Mr Ueda, "the building responds to even the most powerful jolt of an earthquake with a graceful swaying, never an abrupt shaking." Here again, Japanese master builders of a thousand years ago anticipated concepts of modern structural engineering: stiffness, moment of inertia, and radius of gyration.

One Last Rriddle

So the secret of the Japanese pagoda's enduring strength and stability is out. It is in effect the sum of three mutually reinforcing factors: the inertia of its extra-wide eaves, the freedom of the loosely-stacked storeys to slither to and fro independent of one another, and, above all, the energy-absorbing capacity of the ingenious shinbashira. Together, the whole is a quite extraordinary feat of structural engineering, using poise and balance in place of brute strength.

So ingenious is it that one cannot but wonder: did the Japanese craftsmen of 14 centuries ago stumble on the concept of the shinbashira by accident, or by inspiration? All one can say is that the idea of an upright wooden pillar with one end buried in the ground to tap the spirits of the inner world has been a religious symbol in Japan since the earliest of times. Recent excavations of Jomon sites dating back to 10,000 B.C. have unearthed evidence of wooden posts being used for ceremonial purposes. One modern view is that, like the early Christians in Europe, the early Buddhists in Japan sensibly incorporated much of the native religion that went before.

If that were the case, the early pagodas may have incorporated the Indian symbolism of the stupa with the early Japanese symbolis The idea that the shinbashira could be as much a religious object as a dynamic balancing device for dampening the destructive forces of earthquakes and typhoons is attractively reassuring. God is in the details, after all.



参考译文

在这片经常遭受台风席卷以及地震肆虐的土地上，日本如何使大约500座最高且看上去脆弱易倒的古老木质宝塔矗立了几个世纪？根据记录显示：在过去的1,400年里，这些宝塔中只有2座倒塌了。那些消失了的——而且是很多——宝塔都是在闪电引起的火灾或者在内

战中被摧毁的。1995年发生的灾难性的阪神大地震造成6,400人死亡，致使高架高速公路断裂，将办公区夷为平地，摧毁了神户的港口。然而位于京都附近的东条寺庙5层高的宝塔却安然无恙，而这场地震中它周围的许多低矮建筑却颓然倒下。

为什么这些高耸的纤细的建筑物却如此纹丝不动？日本学者对此困惑了好几个世纪。在因地震而惶惶不安的日本，直到30年前，建筑业才有足够信心去建筑一些超过12层高的由钢铁和钢筋混凝土建成的办公区。通过使用特殊的减振器来减弱地震带来的楼房突发的侧向运动，位于东京中心建于1968年36层高的霞关大楼——日本的第一座摩天大楼——被认为是有重大影响的杰作。

6世纪随着佛教的引入，多层宝塔也随之从中国传到日本。中国人主要是用石头建造带有室内楼梯的宝塔，而且这些宝塔可以用作瞭望塔及敬奉之用。然而在日本，这种建筑经过了自由改造以适合当地的环境需求。

日本人坚持使用木材作为建造的原材料，他们觉得没有理由用一个室内楼梯来破坏这个设计。日本宝塔的上层没有实际用途。事实上，宝塔内甚至通常没有楼梯。根据京都精华大学建筑学教授伊藤淳史植田的观点："日本宝塔已经从一种观测塔演变成一种有艺术鉴赏目的的宝塔。"

除了地震以外，日本群岛和西北面的大陆最大的区别在于降水量的多少。每年夏季，日本本土就会饱受来自菲律宾的多次台风的侵袭。为了解决比中国多出2倍多的年降水量这一问题，日本建筑师们很早就知道使建筑物的屋檐出檐伸远，远离墙壁。这就可以防止雨水顺着墙壁流到地基里，从而导致土壤变得松软，最终致使建筑物倾斜甚至倒塌。中国和韩国的宝塔都没有日本宝塔的这种突檐建筑风格。

迄今为止，这一做法都如此明智。但是为什么塔具有冲击韧性呢？是不是因为日本宝塔有着被称为shin-ba-shi-ra的像巨大树干一样的中心柱子，所以当台风来袭或者地震发生时就会像一棵高高耸立的松树一样弯曲或者摇晃呢？几个世纪以来，很多人都是这样认为的。但是答案并没有这么简单。

很多事实都证实宝塔的工作原理完全不像松树。最让人吃惊的就是树干一样的心柱根本就没有承载任何重量。在一些宝塔设计里面，甚至不是靠地面来支撑柱子的，而是松松地悬挂在宝塔的顶端，从通风井处顺着建筑物的中间往下。建筑物的重量全部由构成建筑物正方形外围的12根结实的柱子和小一些的正方形内围角落的4根柱子支撑着。

宝塔的另一个不同之处在于，因为每一个连续正方形的平面底图比它下面一个要小，建筑物变得越来越尖细，所以承载着建筑物重量的垂直柱子没有和它上面相对应的柱子相连。换句话说，一座5层高的宝塔里甚至没有一根径直穿过建筑物来承载建筑物整体重量的柱子。这种设计是不符合日本现行建筑标准的。现在两三层的木质建筑物必须得有顶梁柱，这些顶梁柱牢牢地连接着屋顶和地基。

日本宝塔第三个特别之处就是有意地在每一层的大屋檐上堆满厚重的土砖。如果将它们比成是被积雪压着的树枝，风一吹树枝就会从树干上撕扯下来。让屋檐变轻是件很容易的事情——比如说用木制屋顶板代替砖瓦。所以说屋檐的面积和重量很可能是宝塔能够屹立不倒的原因之一。

另一个让宝塔不同于树的特征是：令人奇怪的是，每一个单独的楼层事实上并没有彼此连接。它们只是简单地一个叠在另一个的顶端，就像堆积起来的帽子。连接楼层之间的

是一些松松的木质托架，这些托架允许每一个楼层向四周滑行。

在能够准确判定宝塔的稳定性原因之前，需要揭开另一个奇特之谜。简单地说，如果心柱在结构上不起作用，那它的实际用处究竟是什么呢？迄今为止它是这类建筑物里最大的一块木材。它以最直的有着直木纹的日本柏树为原材料，其价格相当昂贵。它不可能简单地被用来支撑由9个圈形装饰物和使宝塔顶端生辉的宝珠组成的“最高点”。在建筑物的顶端加上一个起装饰作用的尖塔有许多十分简单的方法。

所以日本宝塔长久屹立不倒的秘密就要揭晓了，那就是3个互相强化的因素共同在起作用：超宽屋檐的惯性，松松地叠在一起的楼层不依赖彼此自由地来回滑行，最重要的是设计独特而精巧的心柱所具有的吸收能量的能力。总体来说，整个设计是结构工程的一项壮举——那就是用平稳和平衡代替了蛮力。

核心词汇

typhoon [tai'fu:n] *n.* 台风
earthquake ['ə:θkweik] *n.* 地震
pagoda [pə'gəudə] *n.* 宝塔
unscathed [ˌʌn'skeiðd] *adj.* 没有受伤的，无恙的
level ['lev(ə)l] *vt.* 弄平，使夷为平地
mystify ['mistifai] *vt.* 使难解，迷惑
seismic ['saizmik] *adj.* 有重大影响的，地震的
clutter ['klʌtə] *vt.* 弄乱
evolve [i'vɔlv] *vi.* 进化，发展
batter [bætə] *vt.* 打坏，损坏
overhang [ˌəuvə'hæŋ] *n.* 突出部分，伸出部分
suspend [səs'pend] *vt.* 挂，吊
bizarre [bi'zɑ:] *adj.* 奇异的
taper ['teipə] *vi.* 逐渐变小，变尖
storey ['stɔ:ri] *n.* 楼层
earthenware ['ə:θənwεə] *n.* 陶器，土器
bracket ['brækit] *n.* 支架，托座
decorative ['dekərətiv] *adj.* 装饰的
stability [stə'biliti] *n.* 稳定性
extraordinary [iks'trɔ:dnəri] *adj.* 非常的，特别的

In City Living, How Crowded Is Overcrowded?

10. 城市生活，多拥挤才是过度拥挤？

机经选粹

这一篇文章是讲拥挤和人口密度的，说明了拥挤对于城市、百姓和工作场所等的影响。

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In City Living, How Crowded Is Overcrowded?

In 1962, an article in the magazine *Scientific American* created a shock wave. Entitled *Population Density and Social Pathology*, it reported a series of experiments on the effects of overcrowding on caged rats: high infant mortality due to poor nest-building, high adult mortality, aggression, sexual deviations and cannibalism.

This was followed by a number of best-sellers speculating on human behaviour in overcrowded conditions: *The Naked Ape* (1963), *On Aggression* (1966), *The Territorial Imperative* (1966), *The Human Zoo* (1967). The popular perception was that overcrowding was exacting a terrible toll on urban life.

The irony is that in the past half-century there have been dramatic decreases in overcrowding in the midst of huge increases in metropolitan population, especially in North America. But as society realizes that suburban expansion has become environmentally and economically unsustainable, and that we need higher-density urban living if we are to provide affordable housing to an ever-increasing segment of our population, the effects of crowding are becoming once again a real concern.

While studies about animal crowding offer interesting insights, crowding for humans is a psychological as well as an objective phenomenon.

The question is not simply how many people are in a particular space, but how the space is organized and for what purpose. Individuals can experience crowding as pleasurable as well as painful. A theatre, stadium or party is seldom described as overcrowded; it is full, packed, sold out.

Crowding increases environmental frustration, but it also improves economic opportunities and social interaction. In the home, it creates friction; on the street and in the neighbourhood, it improves enjoyable encounters. What seems to count most is people's subjective appraisals about population size and composition.

Crowding magnifies the need for privacy. When they suffer "stimulus overload," people become socially withdrawn and relatively unconcerned with others, and their interaction with others becomes more utilitarian, superficial and transient. But a sense of personal control and long-term residence can serve as powerful buffers to prevent people from being aggravated, and enable them to better use the social opportunities. The adage that good fences make good neighbours, though simplistic in many ways, has a good deal of truth to it.

Our urban density will increase. What will make it tolerable, perhaps even enriching, is choice—a variety of home and neighbourhood environments that satisfy people's different values and needs regarding autonomy, privacy, interaction and control.

Jane Jacobs, the noted urbanist, argued for mixed uses and diversity. Her ideal was New York's Greenwich Village of the 1960s, where her experience was one of vibrancy, colour and tolerance. Urban sociologist Herbert Gans modelled the good neighbourhood on the working-class West End of Boston, before urban renewal in the 1960s "destroyed" it. He saw in it a culturally homogenous, socially compatible "urban village," a "home ground" to which one belongs and is emotionally committed.

What we need is not more diversity within neighbourhoods, but a greater variety

of neighbourhoods, each with its distinct lifestyle and psychological identity. As our cities become more crowded, economic pressures will push up building density. The higher-density neighbourhoods must be allowed to evolve out of the existing ones. They cannot be "designed" by governments—that much we learned from our mistake of the massive urban renewal of the 1960s: from the ubiquitous high-rise ghettos that one finds in nearly all big cities to the infamous Pruitt Igoe project in St. Louis, where the authorities had to dynamite the whole housing project because it was unsalvageable. The neighbourhoods must grow gradually and incrementally.

Governments can help. Many of our building codes and land-use standards still reflect a Victorian conscience. Regulations about minimum floor space, separation between buildings, height restrictions and set-back from streets are based on our reaction to Dickensian squalor and congestion. Conditions have since improved significantly. These regulations should be relaxed.

On the other hand, standards about road widths, street layouts and the location of facilities such as shopping centres and sports arenas were developed at a time when cars were big, fuel was cheap and land was in seemingly unlimited supply. These should be tightened up: narrower pavement widths, higher building densities, shorter street blocks and smaller catchment areas for schools and other facilities.

In any change, it is always the old, the poor, and the disadvantaged who are the most vulnerable. Most are long-time residents. Their presence provides the essential continuity and stability to the neighbourhood during transition. Every effort should be made to ensure that they stay.

As an environment becomes familiar, we deal with it less consciously and more effortlessly. Psychologists call this habituation. It requires energy to move and stay in a new environment. Good government is to strain this adaptability as little as possible.



1962年，《科学美国人》杂志上的一篇文章制造了一场冲击波。这篇题为《人口密度和社会病理学》的文章报道了研究过度拥挤对笼内老鼠的影响的一系列实验，这些影响包括：糟糕的巢居格局造成的幼鼠的高死亡率、成年老鼠的高死亡率、侵略性增强、高性变异率以及高同类相食率。



在此之后，出现了许多对过度拥挤环境下的人类行为进行思考的畅销书籍：《裸猿》(1963年)、《论攻击》(1966年)、《国家领土》(1966年)、《人类动物园》(1967年)。人们的普遍认识是，过度拥挤需要城市生活付出可怕的代价。

具有讽刺意味的是，在过去的半个世纪里，大都市人口大量增加的同时，过度拥挤的情况一直呈戏剧性地减少，尤其是在北美。但是就像社会认识到的那样，从环境和经济方面考虑，人类已经无法继续向郊区扩张，而且如果要为不断增加的人口提供他们负担得起的住房，我们就得创造更加高密度的城市生活，拥挤带来的影响就再次成为一个真正的焦点。

对动物拥挤的研究为我们提供了有趣而深刻的见解，拥挤对人类来说，不仅是一种客观现象，更是一种心理现象。

问题不只是简单知道在一个特定的空间内有多少人，而是这个空间是如何安排的，安排的目的又是什么。个人体验拥挤的感受不同，它既可以是愉快的也可以是痛苦的。剧院、体育场或者社交聚会场合很少被描绘成超级拥挤的场所，人们通常会遇到这样的情况：已经客满了；里面已经挤满人了；票已经售完了。

拥挤加剧了环境的恶化，但也为经济发展提供了更多的机会，同时增进了社会互动。在家庭中，它会使家庭成员之间产生摩擦；而在街上和邻里之间，它制造了更多令人愉悦的邂逅。这其中最重要的似乎是人们对人口的规模和构成的主观评价。

拥挤放大了人们对隐私的需求。当人们承受“超负荷刺激”时，他们在社交上就会变得内向，对他人也会显得相对冷漠，而且与其他人的互动就变得更加功利、肤浅和短暂。但自我控制意识和长期的居住地，可以作为强大的缓冲器，防止人们的状况继续恶化，从而使他们能更好地利用社交机会。谚语“好墙修好邻”，虽然从许多方面来看过分简单了些，但却是的的确确的真理。

我们的城市人口密度会增加。令这种情况可以被容忍，或许甚至说是愈加丰富的原因，就是选择——满足人们对自主权、隐私权、互动和控制的不同价值观和需求的各种家庭和邻里环境。

著名的城市规划专家简·雅各布斯主张环境的混合用途和多样性。她的理想规划是纽约20世纪60年代的格林威治村，在那里，她感受到的是生气勃勃、丰富多彩和宽容。城市社会学家赫伯特·甘斯以波士顿最西端一个工人阶级居住的社区为例，他认为该社区在20世纪60年代市区重建时遭到“破坏”。在被破坏之前，该社区是一个好社区的典范。他在这里看到的是一个文化上同源、社会和谐的“城市村庄”，一个人可以有归属感和可以投入全部感情的“家的场所”。

我们需要的不是邻里之间更多的多样性，而是多样化的住宅区，每一处都有它独特的生活方式和心理身份。当我们的城市变得越来越拥挤时，经济压力会使得建筑密度加大，更高密度的住宅区必须从现有的局面中解脱出来。它们不能由政府“设计”——这是从我们20世纪60年代大规模的市区重建的错误中学到的：政府在重建过程中修建了各种社区，包括在每个城市都普遍存在的向高空发展的贫民区，以及在圣路易斯臭名昭著的普鲁蒂—艾戈工程——该工程到最后毫无用处，当局不得不炸毁它。住宅区必须以渐进方式递增。

政府能为此提供一些帮助。很多建筑法规和土地使用标准仍然反映了维多利亚时代的意识。有关最低建筑面积、建筑物之间的距离、建筑物的高度限制和其离街面距离的规定都是基于我们对狄更斯小说中描述的肮脏和拥挤的反应。自那以后状况已有显著改善，所以这些规定应予以放宽。

另一方面，在汽车体形巨大、燃料廉价、土地看似用之不尽的时候，有关道路宽度、街道布局、相关设施如购物中心和体育场馆等的位置的规定标准同时也要制定。这些还要得以加强：更狭窄的人行道宽度、更高的建设密度、更短的街区和为学校及其他设施准备的更小蓄水区域。

在任何变化中，老人、穷人和弱势群体通常都是最易受到伤害的。他们大部分都是长期居民。他们的存在保证了过渡时期居住区的必要的连续性和稳定性。政府应做出各种努力确保让他们留下来。

当一种环境变得熟悉时，我们就能更随意更轻松地应付它。心理学家把这称为适应性。在一个新的环境里迁移和居住都需要花费很大的力气，因此一个良好的政府就是要尽可能少地利用这种适应性。

核心词汇

shock [ʃɔk] *n.* 震惊，冲击
overcrowd [ˌəuvəˈkraud] *vt.* 使过度拥挤，使容纳过多的人
cage [keidʒ] *vt.* 把……关入笼内
cannibalism [ˈkænibəlizəm] *n.* 同类相食
speculate [ˈspekjuˌleit] *v.* 深思，推测
toll [təul] *n.* 代价
insight [ˈinsait] *n.* 洞察力，见识
pleasurable [ˈpleʒərəbl] *adj.* 令人愉快的，快乐的
friction [ˈfrikʃən] *n.* 摩擦，不和
appraisal [əˈpreizəl] *n.* 评价，评估
superficial [sjuːpəˈfiʃəl] *adj.* 表面的，肤浅的
aggravate [ˈægrəveit] *vt.* 使……恶化，加重
simplistic [simˈplistik] *adj.* 过分简单化的
autonomy [ɔːˈtɔnəmi] *n.* 自治，自主
urbanist [ˈəːbənist] *n.* 城市规划专家，都市专家
compatible [kəmˈpætəbl] *adj.* 能共处的，和谐的
incrementally [ˌinkriˈmentəli] *adv.* 增量地，增加地
squalor [ˈskwɔlə] *n.* 肮脏
congestion [kənˈdʒestʃən] *n.* 混杂，拥塞
pavement [ˈpeivmənt] *n.* 人行道
adaptability [əˌdæptəˈbiliti] *n.* 适应性，顺应性





第三章
医疗健康类

Can You Catch Obesity?

1. 你会患肥胖病吗？

机经选粹

这一篇讲的是肥胖问题。人们没有把肥胖当作一种病。科学家分析了肥胖与哪些因素有关系。

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Can You Catch Obesity?

For most of human history, being fat was a sign of success.

Obesity meant you had the money, and the time, to consume excess food. It also meant that your pampered and privileged body was not troubled with the rigours of too much exercise.

How different it is now. Fatness is a sign of poverty, obesity marks you as a member of the underclass. The overweight are perceived as lazy, slovenly, even stupid. The fat are shunned socially and professionally.

The obese, like the short and the ugly, earn less, have less sex, fewer children, worse jobs and are more likely to be unwell and die younger than their more svelte brethren.

But what if being fat had nothing to do with sloth, gluttony or even bad genes? What if obesity were caused not by behaviour but by a viral infection—that you could catch like the common cold? Would society treat the superoverweight differently if it were shown that it was, quite definitely, not their 'fault'?

A couple of years ago, a maverick Indian scientist hit the headlines with his theory that the American obesity epidemic was caused by a virus sweeping across the United States.

His claims were dismissed by experts, but he persisted with his research. Now, with publications in respected scientific journals under his belt, he is being taken more seriously.

Next week, in a major TV investigation, it will be claimed that this virus may have crossed the Atlantic and gained a foothold in the UK.

If so, the days of laughing at those gross Americans with their 100inch waists, comedy trousers and broken furniture, are over.

One thing all experts agree is that obesity

is an epidemic that is sweeping the world. More than one-in-three people in the U.S.—that is 90 million people—are obese.

Despite a national obsession with the perfect body, low-fat diets (54 million Americans are actively trying to lose weight at any one time) and exercise, America just keeps on growing.

And where America leads, Britain follows.

One in five Britons is now obese, and this country has now overtaken the United States in the rate at which obesity is increasing.

Experts say the reasons for the 'fat plague' are straightforward: we eat too much, and do too little exercise. Added to that there is a genetic disposition among some people to become overweight.

But some facts about the obesity epidemic simply don't add up. We eat a little more and exercise much less than our grandparents, but poor diets and sloth have not increased notably in the past 20 years—the period in which the obesity epidemic has taken off.

In the Seventies, Americans ate roughly as much as they do today, yet, as a nation, the U.S. was but a shadow of its future self.

Many experts acknowledge that they must be overlooking some important factor. Dr Nikhil Dhurandhar certainly thinks so.

Dr Dhurandhar, now a researcher at Wayne State University in Detroit, Michigan, is the brains behind one of the most controversial medical theories to emerge for years.

It is he who believes that many cases of obesity are caused by a virus, which affects body metabolism, persuading ordinary cells to turn into fat—in effect preventing those who carry the virus from burning off excess calories.

If Dr Dhurandhar is right, it is grim news. For the obese whose condition is caused by the virus, it is too late. The damage is done.

For the rest, the as-yet uninfected, they can hope only to avoid catching it until a vaccine is developed.

The story of how a virus might be causing a fat plague began in the sweltering heat of a Bombay summer.

It was here during the hot monsoon of 1988 that Dr Dhurandhar first came across the microbe that would change the course of his life. Back then, he had a flourishing practice as a doctor specialising in obesity. Vinod, his father, had pioneered the study of the problem in India.

To date Nikhil has treated more than 65,000 cases—including himself and his family—who until relatively recently all had a tendency to be overweight.

Dr Dhurandhar's theory began to take shape when he started studying a virus found in chickens. During the Eighties, Indian poultry sellers were losing money as their birds caught a mysterious disease, which killed hundreds of thousands of birds.

At the Bombay veterinary college the culprit was eventually identified as a virus and given the name SMAM-1.

Unusually, this viral infection was associated with an increase in weight in the infected birds. Dr Dhurandhar was amazed. How could birds ill enough to die of a virus actually be overweight?

"There should be little or no fat," he says. "They

should have been wasting away." The fat chickens, surprisingly, also had less cholesterol in their blood than uninfected thin chickens. This is unusual because raised cholesterol levels and obesity often go hand in hand.

Intrigued, Dr Dhurandhar decided to test the blood of 52 of his most obese patients for SMAM-1 antibodies—their presence would show exposure to this virus which was thought to be harmless to humans.

Amazingly, the antibodies turned up in 10 of the 52 patients—the ten heaviest of all, as it turned out. They also had lowered cholesterol levels.

It soon became clear to Dr Dhurandhar that he had neither the facilities nor the funds to continue his research in Bombay. If he was going to prove to the world that obesity was caused by a virus, he must go to America.

In 1992 Dr Dhurandhar, his wife and son, moved to the United States. He took up a research job in Fargo, North Dakota, convinced that he had the beginnings of an answer to an epidemic that causes around 280,000 deaths in the U.S. each year.

The research job wasn't related to his theory but a necessary means to getting a work permit and access to American academia.

He hoped that before long he would interest someone in the link he believed he'd identified between a virus and obesity, and that funding would follow. After two miserable winters in Fargo—which has a Siberian climate—and still no takers for his obesity virus theory, Dr Dhurandhar was ready to give up and return to his sunny homeland.

Then he got a lucky break. It turned out that Dr Dhurandhar was not the only scientist who suspected that America's obesity epidemic might, at least in part, be triggered by a virus.

After all, the spread pattern of obesity across the United States, from the populated coasts into the interior, exactly mirrored the spread of more conventional epidemics such as flu and even HIV/Aids.

This suggested that human contact could be playing a role in the spread of the fat plague.

RICHARD ATKINSON, an obesity researcher at the University of Wisconsin in Madison, knew that three other viruses—including canine distemper virus—had been shown to cause obesity in animals.

In his lectures, he'd often joked about the possibility that fat could be contagious in humans, too.

Interviewed in New Scientist recently he said, "I'd say, well, it's possible you get on an elevator, somebody sneezes on you, and you catch obesity. It got a good laugh." Dr Dhurandhar was on the verge of buying his plane tickets back to India, when one of his letters ended up on Atkinson's desk. He was invited to work with the American scientist at Wisconsin.

Originally, the two men wanted to import SMAM-1—the chicken virus—into the U.S. so they could study it. But permission was refused. The possibility that this obscure microbe could potentially devastate chicken numbers in the U.S. and perhaps make people fat was too much to risk.

In despair, the two men turned to a related virus, similar to SMAM-1.

This belongs to a group of viruses called adenoviruses, which cause colds, diarrhoea and conjunctivitis.

They picked on one called Ad-36, because it was different enough from the others to make antibodies easy to recognise.

It was an inspired or lucky choice. The virus turned out to have exactly the same effect on chickens as the banned Indian version. Dr Dhurandhar believes that it was not pure luck and the truth is that many other adenoviruses act in the same way as SMAM-1 to make animals fat.

They began their studies and found that the virus affected mice in the same way as chickens. The breakthrough came, however, in an experiment with marmosets, a monkey far closer genetically to humans than either mice or chickens. The results were spectacular.

Three marmosets infected with the virus put on three times as much weight over a six-month span as those monkeys not exposed to it.

If this was translated to a human scale it is suggested the virus could transform a 10st weakling into a 40st hulk.

It was easy for fellow scientists to dismiss results found in chickens.

And many pointed out, correctly, that mice are not men. But dismissing results in a primate species such as marmosets was much more difficult.

Suddenly, the sceptics started to take notice of Dr Dhurandhar.

ALOGICAL, step would have been to infect thin people with Ad-36 or one of its viral relatives to see if they got fat. But, for ethical reasons, this is not possible.

"There is no cure for this infection," Dr Dhurandhar points out. "We don't want to make people obese permanently." The next best thing was to study existing obese people and see if they have antibodies to the Ad-36 virus, showing, retrospectively, a correlation between infection and being overweight.

Dhurandhar and Atkinson collected blood samples from 313 obese people and 92 lean ones in Wisconsin, Florida and New York.

They found antibodies to Ad-36 in just four of the lean people but in 100—32per cent—of the fat ones.

And the obese people exposed to Ad-36 had unusually low cholesterol—levels. If extrapolated, the results suggest that as many as 12 million Americans are infected with the virus.

Of course, it could be the case that the virus and obesity are linked—but the other way round. Could it be that fat people are just more likely to get the virus than the thin?

Being fat has, after all, been linked to a depressed immune system.

To test this, Dhurandhar and Atkinson also looked for antibodies to three other denoviruses-Ad-2, Ad-31 and Ad-37. But all three turned up equally often in thin and fat people, giving greater credence to the idea that Ad-36 was indeed in some way causing obesity.

Slowly, the virus theory—while still extremely controversial—began to gain in respectability.

Dhurandhar and Atkinson's first peer-reviewed paper, on their animal experiments, appeared in early 2000 in the International Journal of Obesity.

Dhurandhar's next big challenge was to

unravel the mechanism. How exactly does the virus make us fat?

At first he wondered if it directly attacked the hypothalamus, the part of the brain controlling basic functions such as appetite.

But he found no evidence of this.

Then, he made a startling discovery.

He found that the virus targets so-called 'pre-fat' cells.

These are immature cells waiting to become fat cells when needed.

The virus forces its DNA into the pre-fat cell, triggering changes in the cell's DNA—turning the little pre-fat cell into a plump fat cell.

And so, the person infected gets fatter and fatter regardless of how much he or she is eating.

If the virus is linked to obesity, and it has spread across the United States, could it have travelled further? Could it have jumped the Atlantic to Britain?

The makers of the Channel 4 documentary featuring Dr Dhurandhar's work decided to test for the virus in the UK to see if it is has infected obese people here.

A group of lean and obese British volunteers gave a blood sample which was tested in a London clinic.

The results revealed that none in the lean group had ever had Ad-36. But 1 in 6 of the obese volunteers tested positive. This raises the possibility that 2 million people in Britain are obese because of the virus.

Unsurprisingly, a theory as radical as this is going to have big problems being accepted by the mainstream scientific community.

According to Dr Stephen Bloom, an endocrinologist at Imperial College in London, the virus theory "seems intrinsically unlikely".

"People are eating much more and exercising less—why do we need to invent some strange theory about a virus and obesity?" he says.

And Dr Dhurandhar himself admits that his idea is far from proven—more work will be needed to confirm whether Ad-36 and similar viruses can trigger obesity.

Many obese people show no signs of being infected, and antibodies to the virus have been detected in a small proportion (5 percent) of lean people, showing that the link between infection and obesity is not straightforward.

Nevertheless, some scientists believe that many of our most common diseases—including Alzheimer's, heart disease and some cancers may turn out to be triggered by infections.

The recent discovery that stomach ulcers were not, as was popularly supposed, caused by stress but by a bacterium, Helicobacter pylori, came as a surprise to the medical community.

Paul Ewald, a biologist at Amherst College in the U.S. believes that by 2050 medical science will come to accept that even diseases such as schizophrenia are triggered by an (as yet unknown) virus.

Professor Iain Broom, a metabolic medicine specialist at Aberdeen University, says he was at first sceptical about the Dhurandhar theory but concedes that there now seems to be some evidence.

He believes that if it turns out the virus is implicated in obesity, it will still mean that only

people with certain genes will be susceptible.

The idea of a fat plague is still heresy. Most doctors say you cannot "catch" obesity.

But if you can, will our attitude to the overweight change? The obese used to mutter, in apology, about "their glands" as an excuse for their condition. Will we be more accepting if it is caused by a common-or-garden virus? FAT PLAGUE, 9pm, Channel 4, Monday, January 6.



在人类大部分的历史中，肥胖是成功的象征。

肥胖就意味着你有金钱和时间来摄入过量的食物。同时也说明你饮食过量的、娇生惯养的身躯没有受到太多运动的折磨。

而现在，一切都不一样了。过多的脂肪是贫穷的象征，肥胖给你贴上了社会底层人士的标签。体重超重被看做是懒惰、邋遢甚至愚蠢的同义词。肥胖者在社会上和职场中都受到了歧视。

但是，如果肥胖和懒惰、暴饮暴食甚至不良基因都没有关系，那又会和什么有关系呢？又或者如果它并不是由行为导致而是由细菌感染引起的，就像是你患普通感冒那样呢？如果调查十分明确地显示，肥胖根本不是那些极超重人群的过错的话，社会对他们的看法会有所改观吗？

2年前，一位标新立异的印度科学家因为其理论而成为新闻头条人物。他的理论声称，美国人的流行性肥胖是由一种横扫美国的病毒导致的。

尽管他的理论遭了专家们的反对，但他仍然继续着他的研究。如今，他在一些著名的科学期刊上相继发表了多篇文章，也因此越来越受到科学界的重视。

所有的专家都认同的一点是，肥胖是一种席卷全球的流行病。在美国，有超过1/3，即9,000万的人过度肥胖。

尽管全美国都痴迷于追求完美身材，他们吃低脂的食物(有5,400万美国人正无时无刻地积极尝试减肥)，努力做运动，但他们的体重还是在不断增加。

在美国的带领下，英国也紧随其后。

如今1/5的英国人过度肥胖，不仅如此，这个国家的肥胖人口增长速度已经超过了美国。

专家们指出，"肥胖困扰"的原因很简单：我们吃得太多而运动得太少。除此之外，在一些人中间还存在导致超重的基因倾向。

但他们并未把一些有关流行性肥胖的事实考虑在内。我们是比祖先们要吃得多，运动得少，可是在流行性肥胖开始盛行的过去20年里，我们的饮食和惰性并没有明显增加。

很多专家承认，他们一定是忽视了一些重要的因素。尼基尔·杜兰达博士也十分确定地这样认为。

杜兰达博士，现在是密歇根州底特律韦恩州立大学的研究员，他主持研究了多年来最有争议的医学理论之一。

正是他，相信许多的肥胖病例都是由一种病毒引起的，这种病毒影响了身体的新陈代谢，促使正常细胞转化成脂肪细胞——实际上就是阻止了携带病毒的细胞消耗过剩的卡路里。

如果杜兰达博士的观点是正确的话，这将是一个可怕的消息。对那些因病毒导

致肥胖的人们来说，一切都太迟了。严重的后果已经造成了。

而对其他人来说，也就是那些尚未感染该病毒的人们，在疫苗出现之前，他们只能寄希望于避免受到感染。

于是，感染了病毒的人不管他或她吃多少，都会变得越来越胖。

如果这种病毒真的与肥胖有关，而且它也已经散播到了整个美国，那么，它会不会已经传播得更远了呢？会不会已经越过大西洋到达英国了呢？

毫不意外，像这样一个激进的理论是很难得到主流科学界的认可的。根据伦敦帝国理工学院内分泌学家史蒂文·布鲁姆博士的说法，病毒理论"看起来根本就不大可能"。

杜兰达博士自己也承认他的想法要得到证实还有很长的路要走——要确定AD-36和类似的病毒是否会引发肥胖，还有很多工作要做。

许多肥胖人士并没有表现出病毒感染的迹象，而科学家仅仅在小部分(5%)的苗条人士身上检测到了该病毒的抗体，这一切都表明感染病毒和肥胖之间没有直接的联系。

然而，一些科学家相信该病毒的感染可能会引发许多的常见病——包括阿尔茨海默病、心脏病和一些癌症。

最近的一项发现震惊了整个医学界，该发现证实胃溃疡不是如人们普遍认为的那样是由压力引发的，而是由一种细菌——幽门螺杆菌所致。

保罗·埃瓦尔德是美国阿默斯特学院的一名生物学家，他认为，到2050年，医学界将会慢慢接受这样的事实：即使是像精神分裂症这样的疾病也是由某种病毒(尽管这种病毒现在还是未知的)引发的。

阿伯丁大学的新陈代谢药物专家布鲁姆教授说，一开始他也对杜兰达理论表示怀疑，但是不得不承认现在看起来已经有了一些证据能够证明该理论是成立的。

他认为即使一旦证实病毒与肥胖相关，这依然意味着只有那些具有特定基因的人才容易被感染。

总之，"肥胖瘟疫"的说法仍然被看做是异端。大多数的医生都会告诉你说："你不会感染肥胖病。"

核心词汇

pampered ['pæmpəd] *adj.* 饮食过量的，饮食奢侈的
privileged ['privilidʒd] *adj.* 有特权的，养尊处优的
rigour ['rigə] *n.* 严格，严酷，苛刻
underclass ['ʌndə,klɑ:s] *n.* 下层社会
shun [ʃʌn] *vt.* 避开，规避
gluttony ['glʌtəni] *n.* 暴饮暴食
superoverweight [,sju:pə'əuvəweit] *n.* 极超重人群
headline ['hedlain] *n.* 新闻提要，大字标题
epidemic [,epi'demik] *n.* 传染病，流行病
obese [əu'bi:s] *adj.* 极肥胖的
weight [weit] *n.* 重量，体重
disposition [,dispə'ziʃən] *n.* 性情，倾向
notably ['nəutbəli] *n.* 显著地，值得注意地
controversial [,kɔntrə'və:ʃəl] *adj.* 引起争论的，有争议的
metabolism [me'tæbəlizəm] *n.* 新陈代谢
calory ['kæləri] *n.* 卡路里
uninfected [,ʌnin'fektid] *adj.* 未感染的
vaccine ['væksi:n] *n.* 疫苗
endocrinologist [,endəukrai'nɔlədʒi] *n.* 内分泌学家
antibody ['ænti,bɔdi] *n.* 抗体
infection [in'fekʃən] *n.* 传染，感染
ulcer ['ʌlsə] *n.* 溃疡
schizophrenia [,skizəu'fri:niə] *n.* 精神分裂症
metabolic [,metə'bɔlik] *adj.* 新陈代谢的

Biofeedback Enhances ADHD Treatments

2. 生物反馈疗法有助于注意力缺损多动障碍症治疗

机经选粹

这一篇讲生物反馈疗法，一种治疗儿童注意力不集中的方法。生物反馈疗法没有普及，因为这种治疗方法比药物治疗更昂贵，更费时。

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Biofeedback Enhances ADHD Treatments

Therapy Helps Some Patients Reduce or Eliminate Medication.

Dec. 20, 2002—Biofeedback, a therapy in which patients are taught to control physiologic functions such as heart rate, muscle tension, and even their brain waves, is emerging as an effective treatment for attention deficit hyperactivity disorder (ADHD). And new research suggests that it may be especially beneficial to patients who can't tolerate or don't benefit from often-used stimulant medications.

Although prescribing drugs such as Ritalin and Adderall are the most common way of managing ADHD and bring improvement in about 80% of patients, says the American Psychiatric Association,they are not without problems. Many children taking them suffer side effects such as sleep problems, weight loss, jitters, and stomach upset, and nearly half of those with some types of ADHD don't respond to the drugs at all. Some experts are also concerned with their long-term use.

But a new study, published in the December issue of *Applied Psychophysiology and Biofeedback*, indicates that ADHD kids who had weekly sessions of biofeedback therapy for a year were able to reduce or eliminate their medication and maintained the same level of improvement in focus and concentration as when they had been on drug therapy.

Vincent J. Monastra, PhD, of the FPI Attention

Disorders Clinic in Endicott, N.Y., studied 100 children between 6~19 with ADHD for a year, all of whom were taking Ritalin and had school and family counseling. But half of the children also had weekly EEG biofeedback therapy, in which they were hooked to a device that measures the activity of their brain waves. "At the conclusion of treatment, all of those who underwent biofeedback were able to cut their medications by at least half—and still enjoy the improvements they got from the drugs. And about 40% were able to discontinue their medication," he tells WebMD. "The kids who didn't get biofeedback needed to continue medication to sustain improvements."

Why biofeedback, which has shown success in treating a host of conditions including migraine and other headaches, chronic pain, digestive problems, hypertension and substance abuse? "Studies show that about 90% of ADHD kids have an under-arousal in activity in the front lobe—the region of the brain that is involved in sustained attention, focus, concentration, and problem-solving," Monastra says. With biofeedback, the theory goes, ADHD patients can be "taught" to bolster activity in these brain areas.

In these sessions, Monastra's study participants were placed in front of a video screen whose characters moved only when the children produced a short but sustained burst of activity in those areas of the brain thought to be under-aroused. In essence, the 51 patients who got biofeedback played a video game that continued only when they exercised the portion of their brain that is deficient in the ability to focus and stay attentive.

"It's like physical therapy for the brain," explains Monastra, who has studied biofeedback's effect on ADHD for several years. "Every time they produced a half-second burst of activity over the frontal lobe, they were reinforced by the screen to continue."

After a year of study, the children in both groups showed improvement in attentiveness from medication and other treatments. But what happened when the researcher abruptly stopped their medication for a full week?

"If you didn't have the biofeedback and I took way your medicine," says Monastra, "you were back to square one—your scores from a very thorough evaluation and medical exam indicated that you had significant problems. But if you had received biofeedback, scores on behavioral ratings of teachers and parents, scores on attention and EEG tests measuring brain activity remained in the normal range of what had been achieved with the drugs. In other words, the kids who got biofeedback maintained the gain they achieved with medication, even without the medication."

Monastra tells WebMD that he isn't suggesting that biofeedback be used instead of medication, but it might offer new hope to many patients. "There are those ADHD children who don't respond to the medications, or they develop side effects that really get in the way of their treatment, or they come from families with a history of substance abuse. For them, this appears to be a great alternative."

According to a recent study in *Psychiatric Times*, biofeedback is used at some 1,500 clinics and treatment centers for various psychiatric applications—including ADHD. The Association for Applied Psychophysiology and Biofeedback reports

that when used to treat ADHD, up to 80% of patients show "significant improvement in the condition and a marked reduction in medication requirements." A biofeedback session typically costs $60 to $150 and lasts about an hour, says Monastra.

"I have treated thousands of ADHD patients with biofeedback since the 1960s and most of them have wound up not needing their medication," says George Von Hilsheimer, PhD, who runs a biofeedback treatment center in Florida that specializes in treating ADHD patients. "You are training the brain to respond, a little at a time. It's like teaching a child how to walk. They get a little more success with each step."



2002年12月20日：生物反馈疗法正在发展成为一种治疗注意力缺损多动障碍症的有效方法。在这种疗法中，病人会在医生的指导下学会控制自身的生理活动：比如说心率、肌肉收缩甚至是脑电波。而且新的研究显示，对于那些不能服用惯用刺激药物或刺激药物使用无效的患者来说，生物反馈疗法也是极为有益的。

美国精神病协会指出：尽管像利他林和阿得拉尔这样的处方药是治疗注意力缺损多动障碍症的最常用方法并且也使80%的患者病情有所好转，但这种疗法并不是没有问题的。很多服用这些药物的患儿出现了副作用，如睡眠问题、体重减轻、烦躁、肠胃不适等，还有接近半数的患有某些类型注意力缺损多动障碍症的孩子对这些药物完全没有反应。一些专家也开始关注它们是否能够长期使用。

但在《应用精神心理学与生物反馈》杂志的12月刊里发布的一项新研究指出，连续1年每周接受生物反馈疗法治疗的注意力缺损多动障碍症患儿已经能够减少用药量或停止用药，而且在集中力和注意力的进步上保持了与药物治疗时相同的水平。

纽约恩迪科特FPI注意力紊乱治疗中心的文森特·J·摩那斯提拉博士花了1年的时间研究100名6~19岁的注意力缺损多动障碍症患儿，这些孩子们都在服用利他林而且都有在接受学校和家庭的辅导。但是他们中一半的孩子同时也在接受每周一次的脑电图生物反馈治疗。在治疗过程中，孩子们被固定在一个测量他们的脑电波活动的仪器上。摩那斯提拉博士告诉大众医疗新闻网："治疗的结果显示，所有接受生物反馈治疗的孩子的用药量都减少了至少一半，但仍然保持有同药物治疗同样的效果。大约40%的孩子可以停止药物治疗了。而那些没有接受生物反馈疗法的孩子还需要继续服用药物来维持疗效。"

为什么是成功治疗了偏头痛和各种头痛、慢性疼痛、消化道疾病、高血压和药物滥用等许多疾病的生物反馈疗法呢？摩那斯提拉说："研究表明，90%患儿的额叶活动都处于低唤醒水平，而额叶是大脑中控制持续注意力、集中力和问题解决的区域。"理论认为，通过生物反馈疗法，注意力缺损多动障碍症患者可以"学会"激活大脑这些区域的活动。

在治疗过程中，摩那斯提拉的研究对象们被带到一个电视屏幕前，只有当孩子们处于低唤醒水平的大脑区域产生了一阵简短但持续的活动时，电视屏幕上的人物才会移动。实际上，这51名患者是在通过

一个电视游戏接受生物反馈治疗，只有当他们使用大脑中那片在控制注意力和专心上有缺陷的区域时，游戏才能继续。

“这就像是对大脑的物理疗法，”多年研究生物反馈疗法对注意力缺损多动障碍症的疗效的摩那斯提拉解释道：“每次当他们的额叶进行了一次半秒的活动时，他们都会受到屏幕运动的画面的鼓励而继续进行游戏。”

经过1年的研究，2组患儿都通过药物治疗和其他疗法的治疗在注意力集中上有了进步。但是，如果研究者突然让孩子们停药一整周的话，会有什么样的结果呢？

摩那斯提拉说：“如果你没有接受生物反馈治疗，而我停了你的药的话，你就会回到原点——彻底评估和医学检查的分数都会显示：你有大问题。但是如果你接受了生物反馈治疗，教师和家长对你行为等级的评分、你的注意力集中程度和测试大脑活动的脑电图的结果都会保持在你服药期间的水平。换句话说，接受生物反馈治疗的孩子即使停药了，也会保持他们服药时所取得的疗效。”

摩那斯提拉告诉大众医疗新闻网，他并不是建议应用生物反馈治疗来取代药物治疗，但是它也许为许多患者提供了新的希望。“有些患儿对药物治疗没有反应，有些则产生了副作用以致阻碍了他们的治疗，还有些孩子是来自有药物滥用史的家庭——对这些孩子们来说，生物反馈疗法是一个不错的选择。”

根据《精神病学时报》最近的一个研究，生物反馈疗法已经被大约1,500个诊所和治疗中心用来治疗多种精神疾病——包括注意力缺损多动障碍症。应用精神心理学与生物反馈研究协会的报告显示，进行了生物反馈治疗之后，高达80%的患者表现出“身体状况明显改善，对药物的需求显著减少”。摩那斯提拉说，通常生物反馈治疗一个疗程需要花费60~150美元，整个治疗过程会持续近1个小时。

“自从20世纪60年代以来，我已经为上千个注意力缺损多动障碍症患者实施了生物反馈疗法治疗，他们中的大多数已经不需要继续服药了。”乔治·冯·希歇默博士说道，他在佛罗里达州经营一个生物反馈治疗中心，专门治疗注意力缺损多动障碍症患者。“你是在训练大脑如何去做出反应，每次一点点。这就像是在教小孩子走路，他们每迈出一步就会多获得一点点成功。”

核心词汇

biofeedback ['baiəu,fi:dbæk] *n.* 生物反馈
hyperactivity ['haipə,æk'tiviti] *n.* 活动过度，极度活跃
stimulant ['stimjulənt] *n.* 刺激物，兴奋剂
jitter ['dʒitə] *n.* 烦躁
eliminate [i'limineit] *vt.* 排除，剔除
counseling ['kaunsəliŋ] *n.* 咨询
medication [,medi'keiʃən] *n.* 药物治疗
improvement [im'pru:vmənt] *n.* 改进，进步
migraine ['mi:grein] *n.* 偏头疼
chronic ['krɔnik] *adj.* 慢性的
essence ['esns] *n.* 本质，要素
attentive [ə'tentiv] *adj.* 留意的，注意的
frontal ['frʌntl] *adj.* 额的，前额的
lobe [ləub] *n.* 叶
abruptly [ə'brʌptli] *adv.* 突然地，忽然地
evaluation [i,vælju'eiʃən] *n.* 评价，评估
behavioral [bi'heivjər(ə)l] *adj.* 行为的
alternative [ɔ:l'tə:nətiv] *n.* 替换物
psychiatric [,saiki'ætrik] *n.* 精神病的
wind up *v.* 结束，使振奋，使紧张

Why Do Happy People and Optimists Live Longer?

3. 为什么开心乐观的人寿命更长？

机经选粹

这一篇讲的是关于乐观与人类健康之间的关系。乐观的人寿命会比悲观的人的寿命更长。



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Why Do Happy People and Optimists Live Longer?

Numerous studies support the belief that people with an upbeat and positive perspective tend to be healthier and enjoy longer lives than those who are generally gloomy and cynical about the future. Always expecting the worst was linked to a 25 percent higher risk of dying before age 65 in a very long-term California study of 1,500 healthy pre-adolescent boys who had been followed since 1921. *(Seligman ME. Mayo Clin Proc. 2000;75:133-4)*

In another report on senior citizens, researchers rated 1,000 Dutch men and women aged 65-85 with respect to their degree of optimism, health and longevity. Over the next 10 years, participants classified as being very optimistic had 55 percent fewer deaths from all causes and 23 percent less heart-related deaths than highly pessimistic controls. These benefits of optimism were stronger in men than women. *(Giltay E. Archives of General Psychiatry, 2004; 61:1126-1135)*

Stay Happy and Save Your Life

Harvard researchers also found cardio-protective effects when they followed 1,306 men who had been rated for optimism and pessimism based on responses to a questionnaire administered in 1986.

During the next 10 years, there were 31 deaths due to coronary disease, 243 instances of non-fatal myocardial infarction

or documented evidence of coronary heart disease and 60 patients had complaints of angina. Men reporting high levels of optimism had almost half the risk of suffering any of these complications compared to peers classified as being very pessimistic. In addition, a dose-response relationship was demonstrated between levels of optimism and each of the above adverse developments. *(Kubzansky LD et al. Psychosomatic Medicine, 2001; 63:910-916)*

It had previously been shown that highly optimistic patients had faster recovery rates following coronary artery bypass surgery and were half as likely to be rehospitalized over the next six months for complications or the need for a repeat corrective surgical procedure.*(Scheier MF et al. J Pers Soc Psychol 1989; 57:1024-40, Scheier MF et al. Arch Intern Med 1999; 159:829-350)*

Cheerful and optimistic heart disease patients were also more likely to live longer than others in a Duke report on 866 cardiac catheterization patients who were asked how much joy they typically felt and completed questionnaires to rate optimism and pessimism.

Over the next 11.5 years there were 415 deaths. It was found that cheerful patients with a positive outlook were 20 percent more likely to be alive than pessimists even after taking into account other factors like smoking and how ill the participants were at the time of catheterization. *(Brummett BH et al. Int J Cardiol. 2005; 100:213-216)*

Optimism Affects Your Stroke Risks

Optimists and happy people may be less likely to suffer a stroke according to a University of Texas study of 2,478 black and white senior citizens in North Carolina who completed a depression questionnaire consisting of yes or no answers to 20 items.

Sixteen of these were negative pronouncements such as "I felt that I could not shake off the blues, even with the help of my family and friends," "I thought that my life had been a failure" and "I felt fearful." The other four statements were positive: "I felt that I was just as good as other people" and "I felt hopeful about the future."

Baseline interviews conducted to gather information on sociodemographic, psychosocial and health status revealed no history of stroke. Similar studies were conducted annually for the following six years during which there were 340 strokes, 75 of which were fatal. Researchers confirmed that increasing depression ratings were associated with a significantly higher incidence of stroke. But they also found that for each "yes" answer to a positive statement there was a 26 percent decrease in the risk of stroke.

Thus, "yes" answers to all four questions were associated with complete protection from stroke, which is the leading cause of long-term disability and the third most common cause of death in the elderly. This is one of the few studies to suggest that the benefits of optimism are not necessarily due to the absence of pessimism. *(Oster GV et al. Psychosomatic Medicine 2001; 63:210-215)*

Get Older, Be Happy

Similar rewards were reported in a study of 600 people over age 50 in a small Ohio town, who, in 1975, completed another questionnaire that included items dealing

with attitudes about aging. They had been asked to rate their agreement or disagreement with such statements as "Things keep getting worse as I get older," "I have as much pep as I did last year" and "I am as happy now as I was when I was younger."

When researchers checked to see which participants were still alive in 1998, they found that optimists who viewed aging as a positive experience lived about 7.5 years longer than participants with a much darker perspective. One might argue that people in poorer health would be more apt to have negative responses and also more likely to die over the next 23 years.

However, even when self-reported health, socioeconomic status, overall morale, loneliness, race, sex, and other possible confounding factors were taken into account, a positive view of aging was still highly correlated with significantly increased longevity. Indeed, this advantage was far greater than that afforded by lowering blood pressure or reducing cholesterol, each of which was found to lengthen life about four years. It was also superior to exercise, not smoking and maintaining a healthy weight that increased longevity by only one to three years.

So why did the optimists live so much longer? The investigators suspected that it might be due to their greater will to live.

Previous studies have shown that people of all cultures are more likely to die in the days and weeks after holidays, anniversaries and other celebrations than they are in similar time periods leading up to them. They checked back to see how the respondents had answered other questions in the original survey in which they had been asked to choose from three pairs of adjectives (empty—full, hopeless—hopeful and worthless—worthy) that best described their lives. Those who answered "full", "hopeful" and "worthy" were classified as having a greater will to live.

Although this appeared to have some predictive value, it still did not completely explain why people with positive views lived so much longer so other factors must contribute to this. It was suggested that one likely candidate is how people respond to stress since older people with a negative view of aging exhibited higher stress levels. (Levy B et al. Journal of Personality & Social Psychology. 2002; 83:261~270)

Between 1962—1965, 839 Mayo Clinic patients completed the same questionnaire used in the Harvard study and 124 were classified as optimists, 197 as pessimists with 518 falling in between. Thirty years later, an analysis of data that was available on 723 of these patients showed that the optimists had a significantly better survival rate than anticipated and lived 20 percent longer than pessimists. (Maruta T et al. Mayo Clinic Proc, 2000; 75:140~143)

In a follow-up study, 447 patients of this group (average age 60) also completed a 36-item physical and mental health survey in 1994. There were 101 optimists, 74 pessimists and 272 did not fall into either classification based on responses to the original questionnaire completed three decades previously. Pessimists scored lower in all physical and mental health categories and optimists were far more likely to report:

- *Having fewer limitations due to physical health.*

- *Having less pain.*
- *Feeling more energetic most of the time.*
- *Feeling more peaceful and happy most of the time.*
- *Having fewer problems with work or other daily activities as a result of their emotional state. (Maruta T et al. Mayo Clin Proc 2002;77:748-53)Studies show that older optimists also tend to have better pulmonary function than pessimists and that this improvement increases progressively over time.*

In one report of middle-aged men who received periodic pulmonary function studies the difference between optimists and pessimists after 10 years on one procedure was comparable to the significant difference between smokers and nonsmokers.



参考译文

很多研究支持这个观点：对待事物乐观积极的人往往比那些通常对未来悲观和愤世嫉俗的人更健康长寿。在一项十分长期的从1921年以来就对1,500个健康、处于青年前期的男孩进行的跟踪调查的加利福尼亚研究中，总是预料着最糟糕的事会发生的人在65岁前死亡的风险要高25%。

在另一份对老年人的报告里，研究者根据乐观、健康和长寿的程度，对1,000名年龄从65~85岁的荷兰男性和女性进行评估。在接下来的10年里，被列为非常乐观的参与者，其来自所有原因的死亡人数比受悲观高度控制的人要少55%，与心脏有关的死亡人数比受悲观高度控制的人少23%。乐观对男性的这些益处要强于女性。

哈佛大学的研究人员跟踪调查了1,306位被认为是乐观和悲观的男性后，基于在1986年实行的问卷调查的回答，他们还发现了乐观对心肌保护的作用。

在接下来的10年，31人死于冠状动脉疾病，243例患有非致命性心肌梗塞或已证实的冠心病，60个病人患有心绞痛。与在同辈中被归类为非常悲观者相比，被归类为是高度乐观的男性中几乎只有所有这些并发症的一半风险。此外，在乐观的各个程度和上述每个不利的发展之间，显示出了剂量反应关系。

以前的研究表明，高度乐观的病人在冠状动脉绕道手术以后康复的速度更快，而且未来6个月，由于并发症再入院治疗或需要有一次重复矫正手术的可能性只有一半。

在一份杜克大学有关866例心脏导管插入术病人的报告中，病人被询问一般感受到喜悦的程度，并完成了评估乐观和悲观的调查问卷，结果表明，开朗乐观的心脏病患者也比其他人更容易长寿。

在接下来的十一年半时间里，有415人死亡。结果发现，甚至考虑到其他因素后，像吸烟，以及在导管插入术中参与者生病的程度，怀着积极生活态度的开朗的病人生存的可能性比悲观者高20%。

根据美国得克萨斯州大学关于2,478位北卡罗来纳州的黑人和白人老年市民的一项研究显示，乐观幸福的人也许不太可能患上中风。这些老年人完成了一份有关抑郁症的问卷，问卷由20项是或否的回答组成。

其中16个人表示出这些消极的看法，如“甚至在家人和朋友的帮助下，我觉得我都无法摆脱忧郁”，“我认为我的生活一直是个失败”，“我感到害怕”。其他4种看

法是积极的，如“我觉得我和其他人一样好”，“我对未来充满希望”。

搜集到的有关社会人口、心理社会和健康状况资料的基线调查显示并没有中风史。类似的研究在接下来的6年里每年进行1次，在这期间有340人中风，其中75例是致命的。研究证实，不断增加的抑郁程度与明显较高的中风发病率相关。但他们也发现，每个对积极看法“是”的回答，中风风险就相应地会降低26%。

因此，对所有4个问题都回答“是”就与完全不会中风相联系，中风是老年人中导致长期残疾和第三常见的死亡原因。这是表明乐观的好处不一定是由于缺乏悲观的少数研究之一。

在一项对俄亥俄州的一个小城市里600位年龄超过50岁的人的研究中，报告了类似的回应，他们在1975年完成了另一项问卷调查，其中包括应对年老的态度的项目。他们被要求对这些看法，如“当我变老时，事情不断变得更糟”，“我拥有和去年一样的活力”，“我像我更年轻时一样快乐”，表示赞同或反对。

当研究人员确认哪些参与者在1998年还活着时，他们发现，把年老视为积极经历的乐观者比怀有相对忧郁态度的人寿命长7.5年。有人也许认为，处在相对糟糕的健康状态下的人会更容易有消极的反应，并且在未来的23年也更可能死亡。

然而，即使把人群自报健康水平、社会经济地位、整体的斗志、孤独感、种族、性别及其他可能混杂的因素考虑在内，对变老的积极看法仍与明显增加的寿命紧密相关。事实上，这种益处远远大于由降血压或减少胆固醇来延长寿命的益处，其中的每一种被认为可以延长约4年的寿命。它也比运动、不吸烟和保持健康的体重要好，因为这几种方法只增加了1~3年的寿命。

所以，为什么乐观的人更长寿呢？研究者猜想，可能是由于他们有更强烈的生存意愿。

先前的研究已表明，与在类似之前的时间段相比，各种文化的人们更可能在节假日、纪念日和其他庆祝活动的几天或几周后死去。他们回头核查在原来的调查中，受访者如何回答其他问题，他们要求从3对形容词（空虚——充实，绝望——希望，不值得——值得）中选择最适合的词来形容他们的生活。那些回答“充实”、“希望”和“值得”的人被归为有更强烈的生存意愿的一类。

核心词汇

upbeat [ˈʌpbiːt] *adj.* 乐观的
perspective [pəˈspektiv] *n.* 看法，态度
cynical [ˈsinikəl] *adj.* 愤世嫉俗的
adolescent [ˌædəuˈlesnt] *adj.* 青春期的，青少年的
longevity [lɔnˈdʒeviti] *n.* 长寿
cardioprotective [ˌkɑːdiəuˌprəˈtektiv] *adj.* 保护心肌的
questionnaire [ˌkwestʃəˈnɛə] *n.* 调查表，问卷
coronary [ˈkɔrənəri] *adj.* 冠的，冠状的
myocardial [ˌmaiəuˈkɑːdiəl] *adj.* 心肌的
infarction [inˈfɑːkʃən] *n.* 梗塞
rehospitalize [riːˈhɔspitəlaiz] *vt.* 再进医院，再入院治疗
cardiac [ˈkɑːdiæk] *adj.* 心脏的
catheterization [kæθitəraiˈzeiʃen] *n.* 导管插入(术)
pronouncement [prəˈnaunsmənt] *n.* 宣布，宣告
sociodemographic [ˌsəusiəuˌdeməˈgræfik] *n.* 社会人口
apt [æpt] *adj.* 有……倾向的，易于的
morale [mɔˈrɑːl] *n.* 士气，斗志
cholesterol [kəˈlestərɔl] *n.* 胆固醇
anniversary [ˌæniˈvəːsəri] *n.* 周年纪念(日)

Breathe Easy? Not When the Office Maybe Toxic

4. 办公环境与员工健康

机经选粹

这一篇讲的是工作环境和员工身体健康。健康专家就工作环境和员工日益糟糕的健康状况进行了一些调查并发表他们的观点和结论。

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Breathe Easy? Not When the Office Maybe Toxic

One morning 10 years ago, a Halifax-based technician for Environment Canada arrived at work to find a mysterious manila envelope on her desk. Curious, she turned it over. Out spilled a chemical filter mask accompanied by a note from her boss.

"This is for you," it read. "You are expected to wear it."

For years, Charlotte Hutchinson had been suffering from headaches and nausea that she attributed to her workplace. Her managers had bounced her from office to office in search of one that didn't make her sick. This flimsy plastic mask was her employer's final gambit, she says.

"Can you imagine how ridiculous you'd look walking around the office in a mask?" says Ms. Hutchinson, who no longer works for the government.

Ms. Hutchinson suffers from environmental hypersensitivity, a condition that employers and even some doctors have traditionally viewed with some skepticism. But new research on office toxins is making Ms. Hutchinson look more like the office equivalent of the canary in the coal mine.

Last week, Australian researchers unnerved cubicle dwellers the world over with a report showing that laser printer emissions are as bad for the lungs as a lit cigarette. Toner particles join the cloud of invisible office toxins that researchers have been identifying in recent years.

The research paints an unsettlingly toxic picture of modern workplaces: desks laden with more germs than a toilet seat, office ventilation systems circulating noxious gases, mould spreading undetected in workplace walls, office chairs and keyboards warping muscles and bones.

Ms. Hutchinson's biggest problem was the air. Until recently, people with conditions such as hers were more sensitive to environmental toxins than any available detection technology. Now, researchers are using sensors that pick up particulate smaller than one micron, or about one-50th the diameter of a human hair.

"We're gaining a new appreciation of this invisible pollution," says Karen Bartlett, a professor at the school of occupational and environmental hygiene of the University of British Columbia.

The problems don't stop at laser printers.

"We hear a lot of people saying they get headaches when they're photocopying," says Frank Haverkate, who runs a Toronto-based company that tests indoor air quality. "Sure enough, when someone has a large job going, the air quality sensors go through the roof."

The particulate floating about offices wouldn't be so bad if ventilation systems were up to the task of filtering it out. With up to several hundred grunts' living, breathing and sweating bodies in a sealed room for eight hours a day, office workers are almost as dependent on good air circulation as airline passengers.

Mr. Haverkate once tested an office where workers were complaining of persistent headaches. He found a cranky old furnace in the basement and perilously high levels of carbon monoxide. "I immediately directed everyone to get out of the building," says Mr. Haverkate, whose business has taken off since 2003, when Ottawa passed a bill imposing a legal duty on company owners to protect workers' safety. "I had a headache for the rest of the day, and here these workers had been in there for weeks."

Somewhat more benign are the germs swarming throughout workplaces. Keyboards, mouses and phones can be so loaded up with microbes as to constitute biological weapons. In tests throughout the Toronto area, Mr. Haverkate has found that most computer keyboards are more rife with microbial creepy-crawlies than bathrooms, a finding that props up recent research from the University of Arizona.

Mr. Haverkate also employs a thermal imaging camera and yellow Lab named Quincy to sniff out mould-infested walls. Moulds grow anywhere that moisture builds up, and their health effects range anywhere from respiratory impairment to organ damage.



The noxious air doesn't always come from within. Dr. Bartlett routinely visits workplaces where bad air is being piped in from outdoors.

Once she tested an office where the air was so redolent of styrene that workers were falling ill. Trudging outside the office, she found that the air intake for the entire office building was situated right next to a fibreglass plant. "They were having a terrible time there," Dr. Bartlett says, "but they never connected the two."

Work Stress and Illness

Even if our offices are clear of mould, printer particles and more biohazards than a medieval infirmary, we can ruin our bodies by sitting and typing improperly. Desk work flattens out the lumbar portion of our backs and distends the muscles in the area of our shoulder blades, giving the seasoned office worker a distinct pear shape.

And none of that even approaches the minefield of illnesses linked to work-related stress, which triggers nearly half of all new depression cases, according to a New Zealand study released last week.

"Work involves your head more than your muscles these days," says Merv Gilbert, a University of British Columbia psychology professor specializing in occupational health. "It used to be an injury to your back that was the biggest problem; now it's an injury to your brain."

Those psychological wounds can be traced to a variety of sources, but the most common factors in the workplace, Gilbert says, are overworking, underappreciation and bullying.

Some companies in Europe have introduced stress testing for employees. But in North America, we're still lagging.

"Our health care system is woefully ill-informed about the workplace," says Dr. Gilbert, who recently developed a free online self-help manual for depression in the workplace.

Considering all these office-linked maladies, cubicle dwellers could be excused for a hint of paranoia. The scare can go too far, however. "In some cases, these complaints need addressing, but in many cases, it's just a seasonal flu spreading through the office," Dr. Bartlett says. "Hysteria quite easily takes hold."

参考译文

10年前的一个早上，一位加拿大环境部哈利法克斯基地的技术人员到达办公室后，在桌子上发现一个神秘的马尼拉信封。她感到很好奇，于是打开了信封。一个化学过滤面具出现在她眼前，同时还有老板给她的一张纸条。

"这是给你的，"上面写道，"希望你戴上它。"

多年来，夏洛特·哈钦森一直饱受头痛和反胃的折磨，她认为这是由工作场所的环境引起的。经理把她从一个办公室调到另一个办公室，只为了找到一个不会让她生病的地方。她说，这个轻薄的塑料面具是她老板最后的策略了。

"戴着一个面具在办公室里走来走去，你能想像那看起来有多么可笑吗？"辞去政府工作的哈钦森女士说道。

哈钦森女士患的是环境过敏症，老板们甚至是一些医生习惯上都对这种病症持怀疑态度。但对办公室毒素进行的一项新的调查研究使哈钦森女士看起来就和煤矿里的金丝雀一样，只是她的地点在办公室而已。

上个星期，澳大利亚研究人员发表了一篇报道称，激光打印机的放射物与一支点燃着的香烟对肺部造成的伤害一样大，这使那些小办公室里的工作人员感到人心惶惶。墨粉也被列入研究者近年来一直在鉴定的办公室里看不见的毒素之一。

研究描绘了一幅使人感到不安的现代工作场所毒素图：桌子上的细菌比马桶座上的还要多，办公室通风系统使有害气体得以循环，霉菌在墙壁上悄无声息地蔓延，办公椅和键盘扭曲了人们的肌肉和骨骼。

哈钦森女士最大的问题就是因为空气引起的。直到最近，和她有同样病情的人们对环境毒素比任何可用的探测技术要敏感得多。现在，研究人员正在利用感应器去获得比1微米还小的或是直径大约只有人类一根头发1/50大小的微粒物质。

英国哥伦比亚大学劳动卫生和环境卫生学院的克伦·巴特利特教授说道："对这种看不见的污染我们正在获得一个全新的认识。"

这种问题不仅仅只存在于激光打印机上。

"我们听到很多人抱怨说，当他们复印时总是感到头痛，"在多伦多经营一家专门检测室内空气质量公司的弗兰克·哈维卡特说："毫无疑问，当某人启动一个大型工作设备时，空气质量感应器就会反应强烈。"

如果通风系统过滤掉那些漂浮的微粒，办公室的情况也不至于如此糟糕。几百人在一间密封的房里生活、呼吸和流汗，每天8个小时，这使办公室员工对良好空气流通的依赖程度几乎和航空旅客一样。

哈维卡特先生曾经对一间办公室做过检测，在这间办公室里工作的员工一直都抱怨头痛。他在地下室里发现了一个有毛病的旧火炉，并且四周弥漫着高浓度的一氧化碳，这使得情况十分危险。"我立即指挥大家从这座大楼里疏散，"他说："那天剩下的时间里我一直感到头痛，而这些员工却已经在这工作了数星期。"自从2003年渥太华通过了一项强制性要求公司老板保证员工安全的法令后，哈维卡特的生意就蒸蒸日上。

办公室里到处都是细菌多少都要比上面的情况好。键盘、鼠标和电话上面沉积了大量的细菌，这些细菌都可以用来制造生化武器。在对整个多伦多地区进行的检测中，哈维卡特先生发现，大部分电脑键盘上布满的令人毛骨悚然的细菌数量要比洗手间里还多。这个发现有利于支持亚利桑那大学新近的一项研究。

哈维卡特先生还使用热成像摄像机和一只名为昆西的黄拉拉(狗的品种)来探测发霉的墙壁。只要潮湿的地方就会长霉，它们对健康产生不利影响的范围很广，从呼吸道受损到器官损害都有。

有害气体并不总是来自屋内。巴特利特教授经常去一些从屋外输进有害气体的工作场所。

有一次，她对一个苯乙烯气味非常强烈的办公室进行检测，这种气味会使工作人员生病。她迈着沉重的步子在办公室外寻查，结果发现整栋办公大楼的空气入口处刚好在一个玻璃纤维工厂右侧。"他们在那里度过了一段可怕的日子，"巴特利特教授说："但他们从来没有把这两者联系起来。"

工作压力和疾病

即使我们的办公室里没有霉菌和印刷机微粒，也没有中世纪医院那么多生物危害，但不正确的坐姿和打字方式同样会损害我们的身体。经常坐在书桌前工作会拉平我们背上的脊椎，扩张我们肩胛骨区域的肌肉，最终办公室老员工的身体会成为一个明显的梨形形状。

根据新西兰上周公布的一项研究显示，上述的这些情况都还没有涉及与工作压力有关的疾病雷区，工作压力诱发了几乎一半新的抑郁症病情。

"现在，你的脑力劳动比体力劳动要多，"英国哥伦比亚大学一名主攻职业疾病的心理学教授梅尔夫·吉尔伯特说："过去最大的问题是背部损伤，而现在是脑部损伤。"

吉尔伯特说，精神伤害可以查出各种各样的病因，但工作场所里最普遍的是过度工作、缺乏赏识和仗势欺人这些因素。

一些欧洲公司为员工引入了压力测试。但北美仍然落在其后。

吉尔伯特说："悲哀地是，我们的卫生保健体系对工作场所毫无了解。"最近他在网上建立了一个免费的自助指南，专门针对工作场所里的抑郁情绪。

考虑到以上所有与办公室有关的疾病，小房间居住者患轻微妄想症则可以被谅解。然而，这种惊恐可能太过火。"有时候，这些抱怨需要引起注意，但大部分情况下，它只是像在办公室里传染的季节性流行感冒一样，"巴特利特教授这样说："歇斯底里症很容易被控制。"

核心词汇

manila [mə'nilə] *n.* 马尼拉
filter ['filtə] *n.* 过滤器
bounce [bauns] *vt.* 使……跳
gambit ['gæmbit] *n.* 话题
skepticism ['skeptisizəm] *n.* 怀疑态度，怀疑论
canary [kə'nɛəri] *n.* 金丝雀
cubicle ['kju:bikl] *n.* 小卧室，小隔间
laser ['leizə] *n.* 激光
toxin ['tɔksin] *n.* 毒素，毒质
ventilation [venti'leiʃən] *n.* 通风
noxious ['nɔkʃəs] *adj.* 有毒的，有害的
appreciation [əˌpri:ʃi'eiʃən] *n.* 认识，欣赏
headache ['hedeik] *n.* 头痛
sweat [swet] *vi.* 出汗
persistent [pə'sistənt] *adj.* 坚持的，持续的
impose [im'pəuz] *vt.* （将义务、负担）加于
microbe ['maikrəub] *n.* 微生物，细菌
moisture ['mɔistʃə] *n.* 潮湿，湿气
styrene ['stairi:n] *n.* 苯乙烯，聚苯乙烯
fibreglass ['faibəgla:s] *n.* 玻璃纤维
biohazard [ˌbaiəu'hæzəd] *n.* 生物危害
lumbar ['lʌmbə] *adj.* 腰的，腰部的
occupational [ˌɔkju'peiʃənəl] *adj.* 职业的
underappreciation ['ʌndəˌpri:ʃi'eiʃən] *n.* 未受到充分赏识
malady ['mælədi] *n.* 疾病

Magnetic Therapy: Using Magnetic Energy for Health

5. 磁疗：利用磁能保持健康

机经选粹

这一篇讲磁能疗法的过去、现在和将来。NASA发现宇航员从太空回来后容易生病，原因是太空中缺乏磁力，而地球的磁场对身体的生理机能有影响，所以之后的飞船上都有了磁力装置。最早应用磁疗的国家有中国、印度等。现在还有美国日本和俄罗斯。文章讲了磁能疗法的商业市场，概括了磁能疗法的操作过程。

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题源全文

Magnetic Therapy: Using Magnetic Energy for Health

Electromagnetic therapy applies magnetic fields—either static or pulsed—that activate the body's natural electromagnetic impulses to assist healing, provide pain relief and support optimal health in prevention and disease. All matter, including the human body, is composed of electromagnetic frequencies (vibrations), the universal energy. Magnetism and electricity are interconnected.

The brain works and communicates using electromagnetic frequencies that can be stimulated by internal or external forces. Interactions between the body and the electromagnetic environment occur continually, forming the biorhythms that also determine the biological clock of the body. The brain and immune system are constantly sending messages to each other via electromagnetic impulses. Both are intricately influenced by energy frequencies.

There are two different types of devices commonly used in magnetic therapy: pulsed magnets or "pulsars" that emit intermittent electromagnetic fields (EMFs)

and permanent magnets that generate static fields of fixed strength and duration. Essentially, both therapies are used for treating the same ailments. There is also a new treatment device developed by a Calgary dentist, which uses very powerful direct current (DC) electromagnetic fields for treatment of disorders of the brain such as Parkinson's disease, muscular dystrophy and stroke.

Pulsed magnets achieve fast and deep results and are especially indicated in the healing of injuries such as bone fractures. Large pulsars are used in hospitals for bone cancers, fractures, etc., and in diagnostics in various ways. Physiotherapists and sports medicine practitioners, who treat large areas of pain, injuries, bone and muscle diseases, often employ powerful pulsars to accelerate healing. In the more sophisticated of these pulsars, magnetic strengths, polarities, frequencies, pulse rates and waveforms are variable.

Modern reduction technology produced tiny but efficient electromagnetic field generators (hand-held pulsars) for personal and in-home therapies. Such small pulsars use only the lower portion of extremely low frequency (ELF) range, yet, are effective for a wide range of ailments and conditions. Small, hand-held pulsed devices include transcutaneous electronic nerve stimulators (TENS) that are mainly used in arthritis and other local pain management.

Permanent magnets generally work more slowly and gently. They are especially appropriate for long-term self-administration. Fixed magnetic therapy is usually applied for longer periods to be optimally effective. Permanent magnets come in great variety. There are acupuncture magnets, small adhesive magnets, magnetic foil and magnetic jewelry, sleeping pads, pillows and magnetic beds.

A magnetic field is generated by all of these therapies, performing essentially the same healing function. Static or permanent magnets are placed directly on the affected area for specific complaints or used periodically to energize and stimulate (i.e., improve blood flow, stimulate nerve and brain functions). When magnets are placed on the meridian points or affected areas, they elicit a brain response very similar to that of acupuncture.

Another form of magnetic treatment is drinking magnetized water or magnetized juices.

Did You Know?

Live cell microscopy determines disease by looking for an abundance of undigested fats in the blood, days after ingestion of fatty substances.

History

The use of magnets for healing can be traced back as far as the ancient Egyptians, Greeks, Romans and Chinese. Pliny, a Roman naturalist, used magnets to heal eye problems, female disorders and wounds. The famous physician of antiquity, Paracelsus, used magnets for many different conditions, claiming that "the magnet is king of all secrets." Karl Friedrich

Gauss (1777—1855), a German mathematician, astronomer and physicist, was involved in the first worldwide survey of the magnetic field of the earth in the early 1800s. He formulated the laws of terrestrial magnetism and began the mathematical theory of electromagnetism. The measure of electromagnetic energy as magnetic induction or changing magnetic flux density uses his name—a gauss being the unit of magnetic intensity.

In 1865, James Maxwell, the mathematician who proved the interrelation of electricity and magnetism in his electromagnetic wave theory, patented an impulse magnetic field device for therapeutic treatment. Magnetic fields had proved to have a noticeable effect on the electrical currents within the body.

Research into magnetic therapeutics continued throughout the world. Oskar Gleichmann discovered the pulsating magnetic field for medicine. This German physician studied the uses of magnetic energy in the treatment of serious disease. He developed a pulsating electromagnetic device, the pulsar, for medical application in the late 1960s.

Hans A. Nieper's 1981 book *Conversion of Gravity Field Energy–Revolution in Technology, Medicine and Society* was the catalyst for the application of static magnetic fields in hospitals and patient care for a variety of conditions.

North American interest in electromagnetic medicine largely grew out of NASA's space program. NASA recognized the importance of stimulative electromagnetic fields to biological organisms when astronauts in optimum health became ill traveling in outer space. Beyond the outermost layer of the atmosphere (ionosphere), the astronauts' bodies were no longer immersed in the geomagnetic fields of the planet. Withdrawn from the influence of these fields, their health deteriorated (rapid bone loss, etc.), but was restored when administering artificially generated magnetic fields that emitted the necessary planetary frequencies. Magnetic field generators installed in NASA's spacecraft alleviated health problems in orbit.

Today, magnetic therapy is well established worldwide. Japan has given official approval for the use of pulsed and permanent magnetic devices for healing. In Germany, the medical results of pulsars convinced the government health care system to officially recognize and reimburse the cost of electromagnetic treatments.

Did You Know?

Cleopatra is said to have worn a magnet on her forehead to maintain her exquisite beauty.

How Can It Help Me?

For most common ailments, specific magnetic therapy results in seventy to eighty percent effectiveness. Use of electromagnetic therapy can often halve the healing time required for sprains, and bone, muscle or tendon injuries. A few days of magnetic treatment usually gives some improvement and minor problems can clear up in a few minutes.

Magnetic therapy helps relieve pain and illness, restores vitality and reduces the need for medications while simultaneously being fully compatible with all types of medications. Conditions that have been helped with magnetic therapy include headaches, back pain, blood pressure disorders, nervous tension, joint and muscular complaints, fractures, broken bones, wounds, burns, arthritis and stomach problems.

Did You Know?

NASA devised rare-earth cobalt magnets to successfully treat illnesses affecting astronauts when they returned from the moon.

When to Use Pulsars?

The use or supplementation of pulsed magnetic fields allows the body to function normally despite heightened environmental stresses. Atmospheric pressure changes are alleviated and interference from electrical household appliances and computers is neutralized. Efficacious, non-invasive in the traditional sense (unlike drugs and surgery), and wonderfully preventive, this therapy has no unwanted long-term side-effects. Insomnia and jet lag show significant improvement. General healing and prevention of scar tissue is promoted. Skin allergies, weather sensitivity, depression, PMS, stress and gastrointestinal ulcers can all be mitigated.

In small pulsars, the low frequency range of less than 10 cycles per second (cps), or hertz (Hz). The higher frequencies of 10~24 Hz prompt stimulative relief similar to the positive pole of static magnets. The pulsed magnetic field initiates the flow of blood and lymph. This flushes out toxins and boosts energy.

When to Use Permanent Magnets?

North and South Pole have opposite spin directions and different healing effects. North, the negative pole, stabilizes biological activity, calms and sedates, and reduces pain, infection and inflammation. The positive South Pole should be used with the advice of a practitioner since it can also overstimulate brain activity and at high strength stimulates the growth of harmful bacteria, viruses, tumors and cancers.

North polarity produces "cold energy" and is used to treat "hot" problems such as pain, inflammation and infection. It sedates and draws out pain and localizes bacteria so it is easier for the body to fight infection. South is "hot energy" used to treat "cold" problems such as weakness, poor circulation and stiffness. It dilates blood vessels, increases circulation, normalizes cell function and stimulates body functions.

In the Northern Hemisphere, the earth's magnetic field is negative (-); in the Southern Hemisphere it is positive (+). Since unidirectional magnetic flux is the key to magnetic revitalization and cell renewal, in either hemisphere the earth's field is passing through our bodies in only one direction, assuring the restoration of energy during sleep

regardless of earth polarity. Supplemental permanent magnetic treatments work with the hemispheric polarities by applying the correct polarities to reinforce the currently depleting earth magnetic flux, but only if the magnets are the right size, strength, number and distance from the body such as a properly constructed magnetic pad.

Did You Know?

Stacked red blood cells reveal poor digestion and circulation; blood cells clumped together indicate an infection or stress.

Causes of Magnetic Deficiency

Stress significantly taxes this complex balance of vibratory energy. Increasingly harmful quantities of high frequency, high voltage alternating current (AC) electrical fields are emitted by the modern electrical sources in industry and in the home. Electropollution hits us from TVs, computers, alarm clocks, radios, microwaves, cellular telephones and all types of electrical appliances. These sources of electropollution are all implicated in the development of cancers, especially leukemia. Even the baby monitor lying next to a child's head emits harmful frequencies.

This dangerous form of high voltage electromagnetic energy is detrimental to health because it conflicts with the natural, low geomagnetic frequencies that corresponds to the resting state of the brain. While the body reacts favorably to these natural frequencies, it becomes disordered with the intervention of fields from common appliances and power lines, resulting in heightened stress, fatigue and lowered resistance to disease. Some buildings in which we live and work, and the cars in which we drive, can block the earth's natural electromagnetic waves from reaching our bodies, as does the steel in concrete and heavy industrial interference patterns. Man-made, high frequency, high voltage electrical and magnetic fields interfere with the brain's frequencies. Modern society is producing an increasing amount of electropollution. High-tension power lines and electrical gadgets inundate us with harmful AC using frequencies of 60 Hz or more. Although these frequencies are also in the relatively low range of the electromagnetic spectrum they still fall into the higher portion of the ELF range.

Computer operators are routinely exposed to strong EMFs. There is an entire sweep of fields that over time can create health problems. It ranges from microwave ovens, cellular and portable telephones to police, military and commercial radar installations.

Excessive electromagnetic interference can cause memory loss, headaches, changes in heartbeat and blood chemistry, and general malaise. Exposure is cumulative, resulting in increased sluggishness and fatigue. Cancer rates have been found to be much higher in areas close to high-tension power lines, especially childhood cancers. Electrosmog blocks out the brain's electromagnetic signals to the cells and weakens the immune system.

Electromagnetic interference is a concern in today's complex world, the more so as electropollution is exacerbated by a cyclical depletion of the earth magnetic field necessary to magnetic resonance, so vital to health. It is estimated that over the last four thousand years, the geomagnetic field has lost up to ninety percent of its original strength and is still depleting. Thus magnetic therapy, though still in its infancy, is increasingly vital in medicine and prevention of magnetic deficiencies.

How Does It Work?

A principle of physics states that: if the magnetic field is increased, the velocity of the electrons and protons will increase or decrease depending on the direction of the magnetic field and the orbits of the particles. The outermost unpaired (valence) electrons are the ones that are shared to make up molecules. These join to make the cells which compose all of the tissues in our body.

When the magnetic field passes through the atoms in the correct direction it will increase their energy state, which in turn will enhance the sharing of their electrons. Also involved is increased precession or "wobble" activity of some electrons depending on the relationship of their orbits to the magnetic field direction. All this increased action is a catalyst to all the chemical reactions in the body.

Some hold that the therapeutic magnetic fields influence the electrolyte balance of cells. By stimulating the skin, magnetic fields act on reflexes in the skin that correspond to certain organs, similar to foot reflexology. Nerve impulses are sent to activate the function of certain organs. The body is a magnetic conductor and possesses its own biomagnetic field.

Continual flow of body fluids is essential to health. When flow is stopped, fluid accumulates in the tissues. Excess fluid can be carried away and disbursed when proper polarization of malfunctioning cells is regenerated, prompting healing. Pulsed magnets are effective because they initiate a resonance in the affected tissues, causing increased ion exchange through the cell wall.

Human nerve paths are electrochemical conductors, able to produce currents and retransmit them. Magnetic fields, from the natural magnetism of the earth or those created by a pure negative unidirectional field such as the earth has in the north hemisphere, underlie the pulsation of these currents.

Healthy cells maintain an active transport of ions, those electrically charged particles important to energy exchanges and cell metabolism. If electromagnetic energy is lacking, the cells malfunction, initiating illness. The magnetic energy from the brain and the earth is a catalyst to the chemical reactions in the cell which are necessary to run the sodium-potassium pump which charges up the cell wall so oxygen will be attracted in and carbon dioxide and other wastes will be expelled.



Magnetized Water

Magnetizing water has been shown to structure it temporarily thus changing its properties temporarily. Some feel that this has beneficial effects.

Magnetized water can be made by putting a glass jug of cool water in, next to, or on a 3,000 gauss magnet (500, 800 or 2,000 gauss strength are also beneficial). Either polarity, negative or positive, or both simultaneously, can be used for magnetizing water. Length of exposure time necessary for magnetization differs among experts, but ten hours will generally suffice. Recommended daily intake varies from two to three doses of an eight-ounce glass of water, up to a quart per day.

Other liquids can be magnetized in the same way, such as fruit and vegetable juices or body oils used for massage. Some feel that magnetized olive oil has been effective in the treatment of gout and rheumatism.

How Is It Done?

It is recommended to consult a practitioner for proper diagnosis and initial treatment. However, after brief instruction, magnetic therapy can be performed at or away from home by just about anyone.

Treatments

The easiest treatment is magnetized water, which is energy-building, activating, cleansing and detoxifying. Half a glass of water on an empty stomach first thing in the morning and continued for several months is optimal under conditions of regular health.

Larger, usually in-clinic electromagnetic therapy machines, create large magnetic impulse fields and are used for vast areas of pain. In Europe they have been used to heal bone cancer.

Small pulsars and permanent magnets offer more specific self-care treatments for pain and ailments. General treatment of the entire body is best achieved by sleeping on a magnetic bed or by wearing a pulsar over the solar plexus. Electromagnetic research has shown that pulsed fields of 2~24 Hz work well. Studies have shown that specific ailments respond best to specific frequencies and day or night conditions.

Smaller permanent magnets are best applied to acupuncture meridian points; reflex points on the hands for problems above the navel and reflex points on the feet for problems below the navel. Pulsars or permanent magnets can be applied to the chest area or spine for general symptoms such as depression or weakness. Body response to pulsars is influenced by frequency settings; the response to permanent magnets is influenced by polarity, which can be bipolar, negative or positive.

Other modalities of vibrational medicine include sound, light therapies.

Specifics of Pulsar Treatments

Small pulsars (battery-operated, hand-held electromagnetic therapy devices) have a flexible range of operation. Most of them oscillate between an extremely low frequency of 2~24 Hz. Small magnetic fields of 2~10 gauss are used in this generation process. Pulsars are placed directly over the site of the pain, injury or affected organ. Pulsars are used for fifteen to thirty minutes once or twice a day for several sessions. In severe cases they can be used for up to three months to accelerate response to treatment.

Pulsar therapy should begin at about 8.5 Hz during active periods, lowered to about 3 Hz during rest periods, and at night. After a few days, frequencies can be adjusted according to personal results and state of well-being. Response time can vary from two minutes to a month, depending on individual sensitivity, environment, medical history and gender. Females generally respond quicker than males. Preceding or ongoing chemotherapy means that the body will need more time to return to homeostasis.

Generally, pulsar therapy should not be continued uninterrupted for long stretches of time as the nervous system's vitality will eventually be depleted, thus reducing the effect.This depletion can be overcome by an on/off approach interjecting regular periods of use and non-use.

Specifics of Permanent Magnet Treatments

Permanent magnets are also best used with an on/off approach. For minor aches and pain, small magnets are worn until there is relief (often within fifteen minutes), or strong 3,000 gauss magnets are used twice a day for half an hour. For acute pain, adhesive magnets are left on for three to ten days, or strong 3,000 gauss magnets are used four times daily for an hour each session. Adhesive magnets are used for chronic pain, for two or more treatments consisting of ten days' continuous wear followed by a rest of two days. Strong magnets of 3,000 gauss are used three times daily for an hour at a time. Large permanent magnets of 2,000 gauss can be used in pairs, with treatments lasting from five minutes to two hours.

For a person who sleeps on their back or side, a negative polarity magnet should be applied to the back or side and a positive polarity magnet to the front. The opposite polarities are used if the person sleeps on their stomach.

A properly constructed magnetic bed pad is a very effective way to receive magnetic treatment while you sleep. It treats the whole body at one time with a very gentle 3~6 gauss negative magnetic field and in studies has been shown to be beneficial for arthritis, fibromyalgia, multiple sclerosis, PMS and back pain. They cause no loss of vitality with continued use.

Who Can Use Magnetic Therapy?

Pregnant mothers and patients with pacemakers should not use magnetic therapy unless advised by their doctor. All others will benefit regardless of sex, age or body type although males generally require longer treatment periods than females

What Will I Feel?

Some users experience minor temporary side-effects, such as dizziness, dull sensation, headache, sleepiness or extra body heat. With pulsed magnetic fields, there can be some tingling. Females usually experience more sensation than males, especially when acute injuries are being treated. Some may develop magnetic resistance when using static magnets of simultaneous polarity or south polarity. This is overcome by applying north polarity. Some may not notice anything in particular, but this is no indication of inefficacy.

What Can I Do?

Magnetic therapies can be easily combined with other forms of treatment, especially acupuncture, massage therapy and reflexology. Homeopathic remedies, healing herbs and water therapy are important adjuncts. The stimulus of magnetic fields should be used as part of a holistic regimen based on proper nutrition, vitamin and mineral supplementation and exercise in a natural, health-promoting environment. If you choose to pursue magnetic therapy, keep the following in mind:

- *To reduce interference with the natural biomagnetic field, unnecessary electrical appliances should be eliminated and those not in use, unplugged.*
- *Magnets should be kept at least one foot away from magnetized items such as computers, videos, tapes and credit cards. Magnets worn on the body should be removed or switched off when receiving X-rays.*
- *Strong magnets must be kept away from batteries as they can drain the battery charge.*



无论是静止的还是受脉冲作用的，电磁治疗利用磁场使人的自然电磁神经脉冲活动起来，来协助治疗，帮助缓解疼痛，在预防和疾病治疗中使人保持最理想的健康状态。所有的物质，包括人的身体，都是由电磁频率(振动)这种宇宙能量组成的。磁性和电流相互联系。

大脑利用电磁频率可以被内部或外部力量所刺激来工作和交流。身体和电磁环境的相互作用不断发生，形成了同样决定人体生物钟的生物节律。大脑和免疫系统通过电磁神经脉冲不断给彼此发送信息。两者都受到能量频率的复杂影响。

现代压缩技术为个人和家庭治疗制造出了体型很小却很有效的电磁场生成器(手提式脉冲星)。虽然这种小型脉冲星只利用了极低频(ELF)范围中的较低部分，但能对大部分的疾病和不良状况产生很好的效果。小型手提式脉冲星设备运用的是主要用于关节炎和其他局部疼痛治疗的经皮神经电刺激疗法(TENS)。

一般来说，永久磁铁的磁性起作用更慢、更温和。它们特别适合于长期的自我治疗。固定的磁性疗法通常需要较长的时间来达到理想的效果。永久磁铁有许多种类，如针灸磁铁、小型黏性磁铁、磁箔和磁性首饰、睡垫、枕头和磁床。

这些治疗均产生某种磁场，在实质上起着相同的治疗功效。人们将静态的或永久的磁铁直接放置在病灶区域来治疗特殊疾病，或周期性地使用它们来达到提供能量和刺激的作用(比如改善血液循环，刺激神经和大脑功能)。磁铁被放置在经脉点或病灶区时，它们促使大脑发生反应，这和针灸很相似。

磁疗的另一种形式是喝磁化水和磁化果汁。

利用磁铁治疗疾病可以追溯到古埃及、希腊、罗马和中国。古罗马自然主义者普林尼利用磁铁治疗眼部疾病、女性生理失调和创伤。古代最著名的医生帕拉塞尔苏斯，在许多不同的情况下使用磁铁，他宣称“磁铁是所有奥秘之王。”卡尔·弗雷德里希·高斯，德国数学家、天文学家和物理学家，在19世纪早期，第一次对地球磁场做了全球范围内的考察。他阐述了地磁学定律，并且开创了电磁的数学理论。对磁场感应和磁通量密度改变时的电磁能量的测量采用了他的名字高斯作为磁场强度的单位。

1865年，数学家詹姆斯·麦克斯韦在其电磁波理论中证明了电流和磁性的相互关系，取得了一个用于疾病治疗的脉冲磁场装置的专利权。据证明，磁场对人体内的电流有非常显著的影响效果。

全世界对磁疗的研究仍在继续进行。奥斯卡·格雷曼发现了用于医学的脉动磁场。这位德国医生研究了磁能在治疗严重疾病中的用途。20世纪60年代晚期，他发明了一种用于医学的脉动电磁设备——脉冲星。

汉斯·尼波于1981年出版的书《重力场能量的转变——科技、医学和社会的革命》是一个催化剂，它促进了静态磁场在医院和对患有多种疾病病人监护的应用。

北美对电磁医学的兴趣主要是从美国国家航空航天局(NASA)的空间计划产生的。在外太空游历的过程中，当最健康的宇航员生病了的时候，美国国家航空航天局认识到刺激性的电磁场对生物有机体是多么重要。在大气层的最外层(电离层)以外，宇航员的身体不在地球的地磁场范围之中。离开了这些磁场的影响，他们的身体状况恶化(快速的骨质疏松等)，但经过人工处理，生成能够放射出地磁频率的必需的磁场时，他们又恢复健康了。磁场生成器被安装在美国国家航空航天局的飞船里，以解决在轨道中运行时宇航员的健康问题。

现在，磁疗已在全世界稳固确立了其地位。日本已经为治疗性的脉动和永久磁性设备提供了官方认可。在德国，脉冲星的医疗效果说服了政府医疗保健系统正式认可和报销电磁治疗的费用。

美国国家航空航天局发明了稀土类钴磁铁，成功治愈了刚从月球返回的生了病的宇航员们。

物理学的一条定律是：如果磁场增强，根据磁场的方向和粒子的轨道，电子和质子的速率将加快或减慢。最外层未配对的(价)电子相互结合，构成分子。这些分子组合在一起构成形成我们身体所有组织的细胞。

当磁场以正确的方向穿过原子时，它将增加原子的能量含量，反过来，会促进原子的电子的结合。同样也会促进一些电子的先行和“摇摆”运动，这取决于它们的轨道与磁场方向的关系。所有这些促进的动作是身体里所有化学反应的催化剂。

有些人认为，治疗性的磁场影响了细胞的电解液平衡。通过刺激皮肤，磁场作用于皮肤，产生反射，这些反射与某些器官相对应，类似于足反射法。神经脉冲被送去活化某些器官的功能。身体就是一个磁性指挥者，掌控着自己的生物磁场。

体液的持续流动是健康的必需条件。当流动停止，体液就会在细胞里聚积。当发生故障的细胞重新受到适当的激化时，过度的体液会被运走和分配，促进身体复原。脉冲磁铁效果很好是因为它们在人体生病的组织里产生磁共振，使透过细胞壁的离子交换增加。

人类的神经通路是电气化学导体，可以产生电流并转发它们。由地球的自然磁性或是由纯阴离子单向产生的磁场，比如地球北半球的磁场，成为这些电流脉动的基础。

健康的细胞保持着对离子的频繁运送，这些离子用生物电力掌控着对能量交换和细胞新陈代谢非常重要的粒子。如果缺乏电磁能量，细胞将发生故障，产生病变。来自大脑和地球的磁能是细胞里化学反应的催化剂，这些化学反应是运转钠—钾泵的必要条件，而钠—钾泵负责给细胞壁充电，促进其吸收氧气，排出二氧化碳和其他废物。

核心词汇

interconnect [.intə(:)kə'nekt] *vt.* 互相联系
biorhythm [.baiəu'riðəm] *n.* 生物节律
pulsar ['pʌlsɑ:] *n.* 脉冲星
transcutaneous [.trænskju(:)'teinjəs] *adj.* 经皮的，由皮的
arthritis [ɑ:'θraitis] *n.* 关节炎
acupuncture ['ækjupʌŋktʃə(r)] *n.* 针刺，针灸
adhesive [əd'hi:siv] *adj.* 有黏性的
energize ['enədʒaiz] *vt.* 使活跃，赋予能量
naturalist ['nætʃərəlist] *n.* 自然主义者，博物学家
flux [flʌks] *n.* 流出，流量
interrelation [.intə(:)ri'leiʃən] *n.* 相互关系
therapeutic [θerə'pju:tik] *adj.* 治疗的，治疗学的
pulsate [pʌl'seit] *vi.* 跳动，搏动
catalyst ['kætəlist] *n.* 触媒剂，催化剂
stimulative ['stimjulətiv] *adj.* 刺激的，激励的
outermost ['autəməust] *adj.* 最外边的，离中心最远的
ionosphere [ai'ɔnəsfiə] *n.* 电离层，离子圈
approval [ə'pru:vəl] *n.* 批准，认可
reimburse [.ri:im'bə:s] *vt.* 偿还，补偿
velocity [vi'lɔsiti] *n.* 速度，速率
valence ['veiləns] *n.* 价，原子价
electron [i'lektrɔn] *n.* 电子
electrolyte [i'lektrəulait] *n.* 电解物，电解质
reflexology [.ri:flek'sɔlədʒi] *n.* 反射论
polarization [.pəulərai'zeiʃən] *n.* 极化
malfunctioning [.mæl'fʌŋʃəniŋ] *adj.* 不正常工作的

Medicine: The Alternatives

6. 医学：替代医学

机经选粹

这一篇讲的是澳大利亚的医学。在澳大利亚年轻的医生是从收入的角度出发来学习，非正统医生比传统的医生收入高。与其他国家不同，澳大利亚很少有人去看正统医生，是因为医生不希望新人接触到相关领域。但到了90年代，越来越多受过教育的人对正统医生产生了怀疑。

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Medicine: The Alternatives

The first students in NSW to study alternative medicine at university level begin their four-year full-time degree course at the University of Technology in Sydney next week.

They will study acupuncture. And the theory they learn will be based on the traditional Chinese explanation for this ancient healing art—that it can regulate the flow of "Qi" or energy through pathways in the body.

The new course reflects how far some alternative therapies have come in their struggle for acceptance by the medical establishment.

There may still be vigorous scientific debate about how acupuncture works, but few orthodox doctors would now dispute that it can have a range of health benefits, notably pain relief.

Acupuncturists, however, are the first to stress that it is also a dangerous procedure in untrained hands.

In 1980 an Australian women died when her lung was punctured by an unaccredited acupuncturist. Two years ago another woman in Melbourne suffered the same injury but survived.

Unscrupulous practitioners who do not use

disposable needles could transmit deadly viruses such as hepatitis or HIV, according to Ms. Shelley Beer, vice-president of the Australian College of Acupuncturists.

Yet anyone in Australia could, at present, practise acupuncture, she pointed out. And training courses ranged from a seven-day program popular with GPs to the four-year university course.

This is one reason the college is lobbying the Government for formal registration of the profession. It also believes that a degree in acupuncture—which is also available at the Victoria University of Technology—should be the future standard of training for all Australian acupuncturists.

"Self regulation can only control those who are eligible to be members of the profession," said Ms. Beer. "There is no control possible over untrained people."

A committee which has developed a set of criteria to help determine whether unregulated health professions should be registered will report next month to the Australian Health Minister's Advisory Council.

Also pushing for national registration are the practitioners of traditional Chinese medicine, which can incorporate acupuncture, massage and herbal remedies.

These practitioners use some "pretty strong and poisonous herbs" that need to be detoxified in the correct way, cautioned Mr. Rey Tiquia , founder of the National Traditional Chinese Medicine Liaison Committee, which aims to improve the understanding between orthodox medicine and traditional Chinese medicine.

Mr. Tiquia said acceptance of Chinese medicine had increased significantly during the 10 years he has been in practice in Melbourne. A degree course was planned at a Melbourne university.

Yet this recognition has been a long time coming. Mr Tiquia pointed out that Chinese medical practitioners had been in Australia since the Gold Rush.

The failure by Western doctors to even try to understand what this ancient practice had to offer was the root cause of their strong opposition, he said. "We could have worked together but it was always a political battle. I'm here to try and bridge the gap."

Australia has been unusual in the Western world in having a very conservative attitude to natural or alternative therapies, according to Dr. Peter Lloyd, a lecturer in the Department of Public Health at the University of Sydney.

"We've had a tradition of doctors being fairly powerful, and the history of our medico-politics is that the doctors have done pretty well out of their position in the health system."

"And I guess they're loath to allow any pretenders to their position to come into it."

Dr. Lloyd said that in many other industrialised countries orthodox and alternative medicine had worked "hand in glove" for years.

In Europe, only orthodox doctors can prescribe herbal medicine. In Germany, plant remedies account for 10 percent of the national turnover of pharmaceuticals.

Americans made more visits to alternative therapists than to orthodox doctors in 1990, and each year they spend about $US12 billion (about $A17 billion) on therapies that have not been scientifically tested.

In Britain, the Royal family has a long tradition of consulting practitioners of homeopathy.

Some Australian natural therapists, such as Mr. Raymond Khoury, secretary of the National Herbalist Association of Australia , perceive the conservatism here as a blessing.

Rather than being locked out of the field, as in Europe, any lay person in Australia can study herbalism and become a practitioner, Mr. Khoury pointed out.

Opposition to alternative medicine—particularly the more esoteric forms—is still strong among Australian doctors, according to Dr. Lloyd.

Dr. Peter Stone, president of the Royal Australian College of General Practitioners, said the college did not like to "put down" therapies which people found useful.

"On the other hand, many of them are just not in the same class as scientific medicine, where research is controlled, and practices are monitored and critically appraised."

He said many people believe drugs are bad and anything natural is good: "But to some extent exactly the opposite is true."

Drugs have to pass strict tests in the laboratory, in human trials and during production, whereas natural products could vary in quality from one batch to the next without the practitioner's knowledge, Dr. Stone said.

However, he said orthodox doctors could learn a lot about bedside manner and advising patients on preventive health from alterative therapists.

"Doctors have got to learn a bit more about healing."

Disenchantment with orthodox medicine has seen the popularity of alternative therapies in Australia climb steadily during the past 20 years.

In the 1983 national health survey, 1.9 percent of people said they had consulted a chiropractor, naturopath, osteopath, acupuncturist or herbalist in the two weeks prior to the survey.

By 1990, this figure had risen to 2.6 percent of the population.

The 550,000 consultations with alternative therapists reported in the 1990 survey represented about an eighth the number of consultations with medically qualified doctors, according to Dr. Lloyd and colleagues writing in the *Australian Journal of Public Health* last year.

They estimated there were between 800 and 1,000 therapists in full-or part-time practice in Sydney.

The rise in popularity here follows the trend in many industrialised nations and

is, in part, a phenomenon of the so-called "post-professional era", according to Dr. Lloyd and his colleagues.

"A better educated and less accepting public has become disillusioned with experts in general and increasingly sceptical about science and empirically based knowledge," they said.

"The high standing of professionals, including doctors, has been eroded as a consequence."

Rather than resisting or criticising this trend, increasing numbers of Australian doctors—particularly younger ones—are forming group practices with alternative therapists or taking courses themselves, particularly in acupuncture and herbalism.

Part of the incentive was financial, Dr. Lloyd said.

"The bottom line is that most GPs are business people. If they see potential clientele are going elsewhere they might want to be able to offer similar sorts of services."

Dr. Tim Carr, a GP and vice-president of the Australian Association of Ayurvedic Medicine, however, argues that doctors become interested in alternative therapies because they are more useful for preventing disease and treating chronic illness.

Dr. Carr, one of about 30 doctors across the country trained in this form of traditional Indian medicine, said orthodox medicine was geared to treating emergency or acute situations.

"It's when we start using drugs for chronic conditions that we get into problems."

Alternative therapies can appear to be spectacularly successful for some complaints. Not even sceptics would deny that, according to Britain's first Professor of alternative medicine, Professor Edzard Ernst of the University of Exeter.

In an article in New Scientist magazine, he writes that it is time orthodox and alternative practitioners developed a mutual understanding.

He writes that it is of little help to patients for doctors to "restate endlessly" and in an emotional way their "old prejudices" that alternative therapists are "cranks, quacks, magicians and madmen".

He argues that, more importantly, modern medicine should make an effort to scientifically test the most promising alternative therapies, because doctors have an ethical responsibility to find good treatments and to discard poor ones.

Several countries have already set up official bodies to monitor the need for research in alternative medicine, he points out.

The US National Institutes of Health, for example, have formed a working group to test alternative methods scientifically, with an annual budget of US$ 2 million.

Orthodox doctors themselves are also beginning to admit they could learn from the personal style of alternative therapists.

The cold, impersonal manner of orthodox doctors featured in a survey of Sydney

people who consulted alternative therapists, published by Dr. Lloyd and his colleagues last year.

Those surveyed—289 people attending eight Sydney practices which offered a wide range of alternative therapies from 25 therapists—were also critical of the effectiveness of orthodox medicine and its reliance on drugs with potent side effects.

Many had experienced chronic illnesses for which orthodox medicine had been able to provide little relief.

They said they liked the holistic approach of their alternative therapists and the friendly, concerned and detailed attention.

Some of their comments on why they went to an alternative therapist included: "The GP wants to see me very quickly. After telling my problem the GP writes a prescription. That's it."

"Not in and out in five minutes and treated like a cattle line."

"I receive an explanation for my condition which actually makes sense."

"His more caring attitude, the respect with which he treats me when answering my questions."

"There are no side effects from drugs."

"Doctors tend to treat symptoms. Homeopaths treat the cause."

Dr. Stone said doctors often disheartened their patients by being honest and realistic.

"If people are crook, they do love to have a rationale. If someone (a therapist) sounds confident that they know what they're talking about, they may be wrong most of the time, but the patient prefers it to someone (a doctor) who says, we don't know what's happening, let's wait and see."

Dr. Stone said that even if doctors do have an explanation for someone's complaint, they often don't make it intelligible to the patient.

"For a lot of medical doctors it doesn't hurt us at all to look at our language and the theories alternative people are offering. A lot just have to do with healthy living habits and ways of feeling better about yourself, or relaxing."

The Sydney survey found that people who visited alternative therapists came from an extremely narrow range of socioeconomic backgrounds. They were mostly women, aged 30 to 49, English speaking, tertiary educated, middle to upper middle class and covered by health insurance. They were also significantly less likely than most people to smoke, drink or take conventional medications.

The survey also suggested that complementary medicine is probably a better term than alternative medicine.

Alternative medicine appears to be "an adjunct, sought in times of disenchantment when cosmopolitan medicine seems not to offer the answer", said Dr. Lloyd.

Most people had either seen an orthodox doctor first about their problem or were still

seeing one simultaneously.

Most people in the survey were also informed consumers and had an accurate and detailed knowledge of their therapists' qualifications and professional affiliations.

Two out of three people had chosen their therapist on the basis of recommendations or reputation.

Dr. Lloyd, however, believes most people in the community are not aware that there are now rigorous criteria that alternative therapists must meet to become members of their appropriate professional organisations.

Consumers were also fairly naive in evaluating the competence of orthodox doctors, he said.

In another study he found this judgment was often based on spurious factors like how long the doctor kept them waiting, bedside manner or even the receptionist's personality.

Ancient Practice Helps Sue

As a chef, Sue Stott didn't have a perfect diet. She grabbed whatever was available and ate at irregular hours.

It was only when she began working full-time as a masseur 18 months ago that she began to eat compulsively and put on weight.

"My blood sugar levels would fluctuate, and I would be aware that I suddenly had to eat," she said.

Her energy levels also dropped. "I didn't have the get up and go that I used to have. I had to push myself a lot."

Being in her mid-40s, she wondered if the problem was hormonal, or simply due to the sudden changes in her work.

On the recommendation of friends, she consulted a doctor who practises both Western and Ayurvedic medicine, which is based on the 6,000-year-old texts of traditional Indian healing.

Much of the doctor's advice was commonsense. Although Sue had only ever snacked on healthy foods like salad sandwiches and dried fruits, she realised during the consultation that she often ate when she wasn't hungry.

Sue has now learnt to listen more closely to her body, and eats only when she needs to.

The doctor also gave her some cleansing herbs, which she believes helped stabilise her blood sugar levels.

Ayurvedic practitioners diagnose disease by feeling the pulse, and divide people into 10 different body types, or constitutions, which affect their susceptibility to disease.

Clients are prescribed diets suitable to their body type and condition. Sue, for example, switched from brown rice to white rice, which takes less energy to digest.

Regular practice of transcendental meditation is an important part of Ayurvedic healing.

Almost back to her old weight, she has regained her lost energy. "I get up with a bounce now," she said.

参考译文

某委员会将于下个月向澳大利亚卫生部长的咨询委员会提交报告，该委员会制定了一套规范，以帮助确定非正规的医学职业是否应该获得注册。

同时，强烈要求国家注册的还有传统中医学医师。中医学融针灸、推拿和草药治疗为一体。

国家中医学联络委员会的创始人雷·提奎亚提醒道：这些医师使用一些“很强劲的有毒草药”，这些草药需要通过正确的方法解毒。国家中医学联络委员会旨在增进人们对正统医学和中医学之间的理解。

提奎亚说，他在墨尔本从事实践活动的10年里，人们对中医的接受程度显著提高了。墨尔本的一所大学还计划要开设中医学位课程。

然而，这是历经了漫长时间才得到认可的。提奎亚先生指出，中医医者们从淘金热时代开始就已经出现在澳大利亚了。

西方医生们甚至不能理解这种古代医学实践能够做些什么，而这正是他们强烈反对的根源所在。提奎亚说：“我们本来是能够合作的，但那常常会引发政治战争。我做这些就是为了试着跨越鸿沟。”

据悉尼大学公共卫生系的讲师皮特·罗伊德博士说，在西方世界，澳大利亚是一个特例，它对自然或替代疗法持有强烈的保守态度。

“我们已有一个非常强大的医生传统，我们医师政治的历史是：医生们在他们的卫生系统职位之外已经做得非常好了。”

“而且我猜他们不愿意让任何一个冒牌货代替他们的位置。”

罗伊德博士说，在很多其他工业化国家里，正统和替代医学已经“携手”合作很多年了。

在欧洲，只有正统医生才能开草药。在德国，草药的营业额占全国医药品营业额的10%。

1990年，找中医看病的美国人比找正统医生的还要多，而且人们每年在还没有经过科学测试的疗法上要花费大约120亿美元(170亿澳元)。

一些澳大利亚自然疗法技师，如澳大利亚国家草药协会的秘书雷蒙德·库里，他们将这里的保守主义视为一件幸事。

库里指出，澳大利亚任何一个普通人都能学习草药医术学，成为医师，而不像在欧洲那样受到限制。

据罗伊德说，对替代医学的反对——特别是对一些更秘传的疗法的反对——在澳大利亚医生中仍然很强烈。

皇家澳洲普通医师学院的校长皮特·斯通博士说，学院不想“放弃”那些人们觉得很有效的疗法。

“另一方面，很多疗法和科学医学都不在同一个等级上。在科学医学中，研究是被严格管理着的，医学实践是被监控并给予了苛刻的鉴定的。”

他说很多人相信药物是有害的，一切天然的都是好的，“但是在某种程度上，它的对立面才是正确的。”

斯通博士说，药物在实验室、在人体受试者身上、在生产过程中都要经过严格的测验。然而如果医师没有专业的知识，那么每一批自然产品(药品)的质量都会不同。

尽管如此，他说正统医生能从替代疗法中学到很多临床知识以及为病人提供如何预防疾病的建议。

"医生们在病人康复上学到的东西更多一些。"

在澳大利亚，人们对正统医学的清醒认识已经导致替代疗法的受欢迎程度在过去的20年里稳步上升。

在1983年的全国健康调查中，1.9%的人说他们在接受调查前的2周内曾咨询过脊椎按摩师、自然疗法师、整骨医生、针疗医生或草药学家。

到1990年这一数字已上升到人口总数的2.6%。

根据罗伊德及其同事去年在《澳大利亚公共卫生杂志》上发表的文章显示，在1990年的一项针对55万名替代理疗师的调查中，大约只有1/8是有医疗从业资格的医生。

他们估计，在悉尼有800~1000名全职或兼职的医疗师。

罗伊德博士和他的同事认为，在许多工业化国家里，也出现了这种趋势，随之而来的是替代疗法受欢迎程度的增加，在某种程度上，这是一种所谓的"后专业时代"现象。

他们说："一群受教育程度更高、接受程度更低的人对通常所说的专家们已经不再抱幻想，他们对科学和靠经验得来的知识越来越感到怀疑。"

"结果是，专业人员包括医生的崇高地位，已经受到了损害。"

越来越多的澳大利亚医生，特别是年轻的医生们，没有抵制或批评这个趋势，而是正在准备与替代疗法医师进行合作或者自学替代疗法，特别是针灸和草药学。

罗伊德说，部分动机是因为金钱。

"最重要的是，大多数普通医师都是商业人士。如果他们看到潜在顾客转移了目标，他们可能会想要提供类似的服务。"

核心词汇

unregulated [ʌn'regjuleitid] *adj.* 无纪律的，未受到管理的

registration [ˌredʒis'treiʃən] *n.* 登记，注册

massage ['mæsɑːʒ] *n.* 按摩，推拿

detoxify [diː'tɔksiˌfai] *vt.* 去毒，解毒

medico ['medikəu] *n.* 医师

pretender [pri'tendə] *n.* 冒充者，假冒者

turnover ['təːnˌəuvə] *n.* 营业额，成交量

therapist ['θerəpist] *n.* 治疗学家，特定疗法技师

esoteric [ˌesəu'terik] *adj.* 秘传的，秘教的

appraise [ə'preiz] *vt.* 评价，估价

preventive [pri'ventiv] *adj.* 预防的

disenchantment [ˌdisin'tʃɑːntmənt] *n.* 觉醒，清醒

naturopath ['neitʃərəpæθ] *n.* 自然疗者，理疗家

osteopath ['ɔstiəupæθ] *n.* 整骨医生

disillusioned [ˌdisi'luːʒənd] *adj.* 醒悟的，幻想破灭的

sceptical ['skeptikəl] *adj.* 怀疑的

empirically [em'pirikəli] *adv.* 经验主义地，凭经验地

herbalism ['həːbəlizəm] *n.* 草药医术学，药草学

clientele [ˌkliːɑːn'tel] *n.* 顾客，客户

Changing Our Understanding of Health

7. 改变我们对健康的理解

机经选粹

这一篇是关于健康的问题。健康状况已经和身体流畅的机械运转联系起来了，生病就被归结于这部机器的故障。这个层面上的健康被定义成没有疾病，并被看做一个医学术语。根据这种观点，为人们制造健康就意味着提供医疗护理去治疗或预防疾病。在这个阶段中，重点被强调的是提供干净的水，改善卫生设施和住房情况。



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Changing Our Understanding of Health

The concept of health holds different meanings of different people and groups. These meanings of health have also changed over time. This change is no more evident than in Western society today, when notions of health and health promotion are being challenged and expanded in new ways.

For much of recent Western history, health has viewed in the physical sense only. That is, good health has been connected to the smooth mechanical operation of the body, while ill health has been attributed to a breakdown in this machine. Health in this sense has been defined as the absence of disease or illness and is seen in medical terms. According to this view, creating health for people means providing medical care to treat or prevent disease and illness. During this period, there was an emphasis on providing clean water, improved sanitation and housing.

In the late 1940s the World Health Organisation challenged this physically and medically oriented view of health. They stated that "health is a complete state of physical, mental and social well-being and is not merely the absence of disease". (WHO, 1946) Health and the person were seen more holistically (mind/body/spirit) and not just in physical terms.

The 1970s was a time of focusing on the prevention of disease and illness by emphasising the importance of the lifestyle

and behaviour of the individual. Specific behaviours which were seen to increase risk of disease, such as smoking, lack of fitness and unhealthy eating habits, were targeted. Creating health meant providing not only medical health care, but health promotion programs and policies which would help people maintain healthy behaviours and lifestyles. While this individualistic health lifestyle approach to health worked for some (the wealthy members of society), people experiencing poverty, unemployment, underemployment or little control over the conditions of their daily lives benefited little from this approach. This was largely because both the healthy lifestyle approach and medical approach to health largely ignored the social and environmental conditions affecting the health of people.

During the 1980s and 1990s there has been a growing swing away from seeing lifestyle risks as the root cause of poor health. While liftstyle factors still remain important, health is being viewed also in terms of social, economic and enviromental contexts in which people live. This broad approach to health is called the socio-ecological view of health. The broad socio-ecological view of health was endorsed at the first International Conference of Health Promotion held in 1986, Ottawa, Canada, where people from 38 countries agreed and declared that: the fundamental conditions and resources for health are peace, shelter, education, food, a viable income, a stable eco-system, sustainable resources, social justice and equity. Improvement in health requires a secure foundation in these basic requirements. (WHO, 1986) It is clear from this statement that the creation of health is about much more than encouraging healthy individual behaviours and lifestyles and poviding appropriate medical care. Therefore, the creation of health must include addressing issues such as poverty, pollution, urbanisation, natural resource depletion, social alienation and poor working conditions. The social, economic and environmental contexts which contribute to creation of health do not operate separately or independently of each other. Rather, they are interacting and interdependent, and it is the complex interrelationships between them which determine the conditions that promote health. A broad socio-ecological view of health suggests that the promotion of health must include a strong social, economic and environmental focus.

At the Ottawa Conference in 1986, a charter was developed which outlined new directions for health promotion based on the socio-ecological view of health. This charter, known as the Ottawa Charter for Health Promotion, remains as the backbone of health action today. In exploring the scope of health promotion it states that: Good health is major resource gor social, economic and personal development and an important dimension of quality of life. Political, economic, social, cultural, enviromental, behavioural and biological factors can all of favour health or be harmful to it. (WHO, 1986) The Ottawa Charter brings practical meaning and action to this broad notion of health promotion. It presents fundamental strategies and approaches in achieving health for all. The overall philosophy of health promotion which guides these fundamental strategies and approaches is one of "enabling people to increase control over and to improve their health" (WHO, 1986).

参考译文

对不同的人和群体来说，健康这个概念的意义也是不同的。健康的这些意义也随着时间的流逝而改变了。当健康概念和养生之道在新方法上受到挑战和延伸时，这种改变在现今的西方社会中更突出。

在大部分西方近代历史上，健康仅仅被认为是身体上的感觉而已。也就是说，良好的身体状况已经和身体流畅的机械运转联系起来了，生病就被归结于这部机器的故障。这个层面上的健康被定义成没有疾病，并被看做一个医学术语。根据这种观点，为人们制造健康就意味着提供医疗护理去治疗或预防疾病。在这个阶段中，重点被强调的是提供干净的水，改善卫生设施和住房情况。

在20世纪40年代晚期，世界健康组织向这个以身体和医学为导向的观点发出了挑战。他们声明："健康是一个包括身体、精神和社会健康在内的完整的状态，而不仅仅是不生病"。(世界卫生组织，1946)。健康状况和人被看做一个整体(智力/身体/精神)，而不只是在生理的范畴。

20世纪70年代是这样一个时期：通过强调个人生活方式和个人行为的重要性来关注疾病预防的问题。有增加生病风险的特殊行为被定为目标，例如吸烟、缺乏锻炼和不健康饮食习惯。创造健康意味着不仅仅是提供医学护理，而且还有促进健康的项目和制度，这些项目和制度可以帮助人们保持健康的行为和生活方式。虽然这种个人健康的生活方式的途径为一些人(社会中的富人)服务，而对那些经历着贫穷、失业、不充分就业或是很少能控制他们每天生活条件的人来说，他们从这种方法中受益很少。这很大程度上因为健康的生活方式的途径和医疗方式两者在健康上都大大地忽视了影响人的健康的社会条件和环境条件。

从20世纪80年代到20世纪90年代，把生活方式上的冒险看做一种导致糟糕的健康状况的根源，对这方面的认识有一个增长的趋势。虽然生活方式上的因素依然很重要，但健康也被看做是与社会、经济和人类生存环境相关的范畴。这样宽泛的健康途径叫做健康社会生态学。这种宽泛的健康社会生态学观点在1986年举行的第一次国际性的健康促进大会上得到了认可，这个大会在加拿大首都渥太华召开，有38个国家同意并宣布：健康的基本条件和资源是和平、住房、教育、食品、维持生存的收入、稳定的生态环境、可持续的资源、社会的公正与平等。为改善健康状况，上述必要条件必须具有坚实的基础。(世界卫生组织，1986)这个声明很清楚地陈述了，健康的创造远不止是提供适当的医疗护理以及鼓励健康的个人行为和生活方式。因此，健康的创造应该包括解决这些问题，例如贫穷、污染、城市化、自然资源损耗、社会疏远和恶劣的工作条件。社会、经济和环境共同对健康创造起作用，不能分开或独立起作用。更确切地说，它们之间是互相影响并且互相依赖的，正是它们之间复杂的相互关系决定了促进健康的条件。一个宽泛的社会生态学的健康观点提出，健康促进应该包括坚固的社会、经济和环境焦点。

在1986年的渥太华会议上，基于健康的社会生态学观点，宪章概述了一个健康促进的

新方向。这个宪章，就是渥太华健康促进宪章，它作为健康行动的主要部分在今天依旧发挥着作用。在探索健康促进的领域方面宪章还声明：良好的健康状况是社会、经济和个人发展的主要资源，也是生活质量的重要部分。政治、经济、社会、文化、环境、行为和生物学因素均可促进健康或损害健康。(世界卫生组织，1986)渥太华宪章给促进健康这个宽泛的概念带来了实际的意义和作用。在让所有人都获得健康这一方面，它展示了一个基本的策略和方法。全面促进健康的哲学体系是“使人们加强控制并且改善他们的健康”的方法之一。这个体系指导着这些基本策略和方法。(世界卫生组织，1986)

核心词汇

promotion [prə'məuʃən] *n.* 促进，提升
breakdown ['breikdaun] *n.* 崩溃，故障
sanitation [sæni'teiʃən] *n.* 环境卫生，卫生设备
holistically [həu'listikli] *adv.* 整体地，全盘地
prevention [pri'venʃən] *n.* 阻止，妨碍
target ['tɑ:git] *vt.* 把……作为目标
individualistic [,indi,vidjuə'listik] *adj.* 个人主义的
ignore [ig'nɔ:] *vt.* 不顾，不理
context ['kɔntekst] *n.* 环境，背景
ecological [,ekə'lɔdʒikəl] *adj.* 生态的，生态学的
endorse [in'dɔ:s] *vt.* 支持，赞同
justice ['dʒʌstis] *n.* 正义，公正
equity ['ekwiti] *n.* 公平，公正
urbanisation ['ə:bənaizeiʃən] *n.* 都市化
depletion [di'pli:ʃən] *n.* 耗尽，用尽
alienation [,eiliə'neiʃən] *n.* 疏远，离间
backbone ['bækbəun] *n.* 脊椎，支撑力量
gor [gɔ:] *n.* 一般战术要求
philosophy [fi'lɔsəfi] *n.* 哲学，哲理

British Children Lack Exercise

8. 英国儿童缺乏体育锻炼

机经选粹

这一篇文章讲英国的小孩子不锻炼，导致健康状况越来越差，而且学校又不督促。然后鼓励家长多参加运动，促进孩子多运动。

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British Children Lack Exercise

Unfit for Adult Life: How much exercise does a child need to become a healthy adult?

The great debate over academic standards, parental control and freedom of choice looks about to be overshadowed by startling evidence that British children are not getting enough basic physical exercise at school to ward off heart disease in adult life.

With schools reporting a sharp downturn in competitive sports and some teenagers in England and Wales now being given PE as an option, research centred in the West Country is uncovering the lack of physical education and its long-term implications. And next month a Government-sponsored report, the School Sport Forum, produced under the auspices of the Sports Council, is likely to call for a radical re-think.

Mr Neil Armstrong, chairman of PE at Exeter University and director of the Coronary Prevention in Children Project, which is working on a three-year project with Exeter Health Authority, has found that school children are "nowhere near active enough to promote cardio-vascular health".

Armstrong's team is the first in Europe to carry out continuous heart-rate monitoring of individual children. Although the study has still to run its course, enough data has been analyzed to show that the children' s heart rate does not exceed frequently enough or for long enough that required to bring about what is called a "training effect". Internationally recognized standards set by

the American College of Sports Medicine to measure fitness in adults (nobody has yet devised a standard for children) recommends three sessions of exercise a week to raise the heart rate for a period of 20 minutes. Armstrong's study is being carried out in two communities in the South West, one of which mirrors the Registrar General's *Profile of the UK*. It involves 600 children aged from 11 to 16. The first results have come from the 11 to 14 age groups. Armstrong hopes to complete his research this term and publish his findings later this summer.

Results from the standard laboratory tests were as researchers would have predicted. According to their genetic endowment some children did very well, others not so well.

But the shock came when electrodes were strapped to children' s chests which transmitted to a receiver worn on the wrist like a watch. The children were free to carry on as normal while they were monitored for 12-hour periods on four week days and one day at the weekend. Fewer than one in 20 of the children were active enough to achieve the "training effect".

The main activity for the majority was watching television an average of 21/2 hours a day. And girls lagged behind even the less active boys. But children who cycled to school and played football in the evening did achieve acceptable levels of exercise.

Armstrong has no doubt that the remedy lies in a radical re-think in school physical education. "Three quarters of PE lesson time is still spent on traditional team games. What we have to do is to teach children activities which will persist in adult life."

The Council of Europe have accepted a Eurofit Project and one of the British representatives is Bill Tuxworth, a lecturer in exercise physiology at Birmingham University. He is not surprised by Armstrong's findings.

"Private schools tend to play sport on several afternoons a week. Yet the average child in State schools gets just one hour a week, 40 weeks a year. In primary schools it's often taught by someone with no expertise in PE."

Liz Murdoch, head of PE at Brighton Polytechnic, whose desk study forms the basis of the Forum report, is concerned that many teachers and parents still think of fitness only in terms of traditional PE lessons. "The ILEA working party recommended one vigorous session of exercise for 20 minutes each day for school children. This can be achieved during a PE lesson or through some other activity." Armstrong agrees and suggests running, swimming, skiing, skating, cycling and even disco-dancing ("a beautiful exercise, provided it's not done in a heavy, smokey atmosphere.").

Tuxworth defends the PE professionals. The community as a whole and especially parents must share responsibility for children's health, he says. "It may seem a reactionary, elderly view, but television has a lot to answer for."

Another expert, Doctor Martin Farrally, director of physical education at the University of St Andrews in Scotland, is optimistic. "We are at last awakening to the fact that there is a problem." But he also sounds a note of caution. All the estimates

of children's fitness are based on adult measurement. "We know that children need to be stretched, but not by how much."

Even if everyone involved accepts the argument, there is still a major dilemma, Liz Murdoch says. "It simply isn't safe for parents to allow their children to play as freely as we would all like. There are not enough safe play areas available."

The Scottish Experiment

An experiment to improve children's fitness in the Linwood area of Strathclyde, Scotland, was started in the early 1980s in one class of 10-year-olds at a primary school. Based on a daily half-hour of fitness activities, the programme was designed to have as many different activities as possible taught by specialists and the children's own class teacher.

The results were spectacular. There seemed to be an improvement in the arithmetic skills of children on the scheme and there was an improved attitude to school itself. Children due to transfer from primary to secondary did not suffer any falling off of performance as is usually the case. Girls benefitted particularly. They were fitter than boys on the normal PE programme. Another finding was that after the summer holidays children on ordinary PE programmes were fitter than they were at the end of the school year. In other words school PE was not even maintaining their normal fitness level.

Dr John Pollatschek, a lecturer at Jordanhill College, Glasgow, who organized the experiment, said that it had now been adopted by more than 100 schools in the area. On the question of cost, he commented: "Compared to the cost of treating a patient with heart disease, it is not high." He believes that catching children young enough is the key. "If children have daily PE from the start of primary until the end of the second year of secondary school then there is not much more you can do. If it has not become part of their lifestyle after nine years of it every day, then it never will."

参考译文

在一个令人惊讶的事实面前，任何关于学术标准、父母管制和选择自由上的强烈争论似乎都变得黯然失色了，这个事实就是：英国儿童在学校里没有得到足够的基本体育锻炼来预防成年后的心脏疾病。

以韦斯特郡为中心所进行的研究揭示了体育教学缺乏的现象和长此以往会引发的危机：很多学校的竞技运动急剧减少、英格兰和威尔士的一些青少年的体育课都已被当作了选修课。下个月，一个由政府主办，体育理事会协助组织的报告会即学校运动讨论会可能会引发一场彻底的反思。

埃克塞特大学体育部部长，儿童冠心病预防项目的主任尼尔·阿姆斯壮先生发现，在校学生“在促进心血管健康方面很不

积极主动”。儿童冠心病预防项目是和埃克塞特卫生局一起运作的一个三年项目。

阿姆斯壮的研究队伍是欧洲第一个对个体孩子进行持续心率监听的团队。虽然研究仍然在按既定的计划进行，但已经有足够的分析数据表明，孩子们的心率加快不够频繁或不够持久以达到“训练效果”。由美国运动医学学院制定的已通过国际认证的成人健康测试标准(目前还没有人制定儿童健康标准)建议每周做3次运动，每次持续20分钟，以使心率加快。阿姆斯壮的研究是在英国西南的2个社区进行的，其中一个反映了注册总署的《英联邦概况》中提到的情况。这次研究涉及了600个11~16岁的孩子。第一次的研究结果来自于11~14岁年龄段的孩子。阿姆斯壮希望在这个学期完成他的研究并将在今年夏末把自己的研究成果发表出来。

标准实验室测试得出的结果和研究者们预测的一样，根据遗传天赋，有的孩子做得很好，有的则没有那么好。

然而，当研究者将电极绑在孩子们的胸口，使相关信息传送到一个像手表一样戴在手腕上的接收装置上时，得出的结果却是令人震撼的。孩子们可以带着装置正常活动，而实验者则对孩子们进行了4个学习日每天12小时以及周末1天的监视。监视的结果是只有少于5%的孩子足够活跃，能够达到“训练效果”的标准。

大多数人的主要活动就是平均每天看2.5小时的电视。女孩们甚至比最不爱运动的男孩们做的运动还要少。但是骑车上学和傍晚踢足球的孩子们确实达到了令人满意的运动量水平。

阿姆斯壮确信补救的办法就是对学校体育教学进行彻底的反思。“体育课3/4的时间还是花在了传统的团队游戏上。我们要做的是教会孩子们那些他们成年以后仍然会坚持的运动。”

欧洲委员会接受了一项欧洲体适能研究项目，比尔·突克斯渥斯是英国的代表之一，他是伯明翰大学运动生理学专业的讲师，他对阿姆斯壮的发现并不感到惊讶。

“私立学校倾向于在每周的几个中午时间做一下体育运动。而在公立学校，通常孩子们的运动时间每周只有1个小时，每年按40个工作周算。在小学，体育课经常是由没有体育专业知识的老师教授的。”

布莱顿理工学院体育部部长里兹·莫道克的初步研究奠定了讨论会报告的基础，他担心很多老师和家长仍然认为健康只是靠传统体育课的方式获得。“内伦敦教育局(Inner London Education Authority)工作小组提议，学龄期儿童每天应该进行20分钟的剧烈运动。这可以通过体育课或其他活动来实现。”阿姆斯壮同意这个观点，并建议进行跑步、游泳、溜冰、骑车甚至跳的士高等运动。(“如果不是在吵闹的烟雾弥漫的环境中进行的话，这是一项很美妙的运动。”)

突克斯渥斯则为体育专业人士辩护。整个社会特别是家长们必须共同为孩子们的健康负责，他说：“也许这个是保守的、陈旧的观点，但是电视也要负很多的责任。”

另一位专家，苏格兰圣安德鲁斯大学的体育教学主任马丁·法瑞利则很乐观。“我们至少清醒地面对了现实，发现了存在的问题。”但是听起来他也有些担心。对孩子的所有健康评估都是基于对成人的测试标准上的。“我们知道孩子们需要舒展肢体，但是我们还不知道要舒展到什么程度。”

尽管涉及的每个人都接受这个观点，但仍存在一个很大的难题，里兹·莫道克

说："如果父母允许孩子们按我们所期望的那样尽情地自由玩耍，这是不安全的，而且也没有足够可用的安全的游乐场地。"

20世纪80年代早期，在苏格兰斯特拉思克莱德林兀德区促进孩子们健康的实验正式启动，实验的对象是一所小学里的一个班，班上都是10岁大的孩子。在每天半小时的健康运动的基础上，这个研究项目还设计了尽可能多的不同活动，这些活动由专家和孩子们自己的老师进行指导。

结果是引人注目的。实验中的孩子们在算术技巧上似乎有了提高，而且对学校本身的态度也有了转变。与通常情况不一样，这些孩子们由小学转向初中也没有产生任何落后的现象了。特别是女孩子们受益匪浅。她们比进行常规的体育项目的男孩子们还要健康。另一个发现是，过完暑假后，在常规体育项目组的孩子们比学期末时更健康。也就是说，学校里的体育课甚至都不能维持学生们正常的健康水平。

"如果孩子们从上小学开始直到初中二年级结束都坚持体育锻炼，那么，你就没有更多要做的了。如果9年的坚持都没有让体育锻炼成为他们生活方式的一部分，那它永远都不会成为他们生活方式的一部分了。"

核心词汇

overshadow [ˌəuvəˈʃædəu] *vt.* 使阴暗，使失色
startling [ˈstaːtliŋ] *adj.* 令人吃惊的
downturn [ˈdauntəːn] *n.* 低迷时期，下降，衰退
uncover [ʌnˈkʌvə] *vt.* 揭露
auspice [ˈɔːspis] *n.* 资助，赞助
continuous [kənˈtinjuəs] *adj.* 连续的，继续的
frequently [ˈfriːkwəntli] *adv.* 经常地，频繁地
fitness [ˈfitnis] *n.* 健康
laboratory [ləˈbɔrətəri] *n.* 实验室，实验大楼
transmit [trænzˈmit] *vt.* 传输，转送
wrist [rist] *n.* 腕，腕关节
acceptable [əkˈseptəbl] *adj.* 可以接受的，令人满意的
persist [pə(ː)ˈsist] *n.* 坚持，持续
physiology [ˌfiziˈɔlədʒi] *n.* 生理学
vigorous [ˈvigərəs] *n.* 精力充沛的，元气旺盛的
especially [isˈpeʃəli] *adv.* 特别，尤其
reactionary [ri(ː)ˈækʃənəri] *adj.* 反动的，反动主义的
awakening [əˈweikəniŋ] *adj.* 清醒的
measurement [ˈmeʒəmənt] *n.* 测量，衡量
arithmetic [əˈriθmətik] *n.* 算术
scheme [skiːm] *n.* 方案，计划
lifestyle [ˈlaifstail] *n.* 生活方式

The Elderly of Today and Tomorrow

9. 老年人口：现状与未来

机经选粹

这一篇研究老年人的疾病和原因，主要是美国老年疾病问题。医学研究发现，因为医学的发展还有营养好，老年人的疾病发病率下降，而且发病的岁数比以前晚；同时还发现，老人比以前更独立。研究还发现人的受教育程度与寿命也有关系。



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The Elderly of Today and Tomorrow

Among the countries of the world, the United States is remarkable for the diversity of its population, including the older population. Population diversity will increase in the years ahead. Within the elderly population itself, there are important differences between the various age segments in terms of their health and socioeconomic characteristics. In the coming decades, the oldest old (85 years and over) will comprise an increasing proportion of the total elderly population. The pace and course of the demographic changes ahead will create compelling social, economic, and ethical choices for individuals, families, and governments. "One can only speculate on the precise number, direction, pace, and synergistic effects of such social and demographic changes for future cohorts in the U.S. population. It is even more difficult to estimate how these matters will be exacerbated or modified by changes in the technological and legal milieus."

The coming growth of the elderly population is inevitable, and will occur worldwide. In developed nations, especially, we can expect to see less of the traditional focus on youth. Already we are beginning to confront impending issues and to seek answers to essential questions. Questions have arisen, principally in developed countries,

pertaining to ethics and aging, such as: what are the moral and ethical limits of euthanasia and end of life treatments; should health care be provided on an age-based rationing system; and who can judge the level of competence of a patient with respect to decision-making. Decisions made today and directions chosen in these and other aging-related areas will directly affect the quality and vitality of our lives for many decades.

We face numerous questions raised by the growth and increasing longevity of the older population. Some of the most urgent are: will tomorrow's generation of older people be healthy; will they be independent; will societies provide productive and purposeful roles for them. Questions about the older population of tomorrow, such as whether more people will be subject to extended years of disability or whether the age of the onset of chronic conditions is going to be postponed, remain unanswered.

While accurate projections of the size, structure, and health of the elderly population are essential to planning public and private programs, data and methodological deficiencies partially limit researchers' ability to answer some mortality, morbidity, and health questions regarding the elderly of the future. For example, the ability to better forecast mortality for specific causes of death will depend on improving cause of death data in vital statistics reports, taking into account multiple causes. Models of human morbidity and morbidity-mortality link-ages are even less developed than mortality models.

Simply considering growth of the elderly population, especially for those aged 80 and over, suggests that there will be increases in the number of incident cancers diagnosed over the next several decades. Other simulation model research has concluded that the interaction of demographic, health, and income trends will result in a tripling of the number of elderly requiring nursing home care between 1990 and 2030, compared to only a 100 to 125 percent increase in the elderly population during this period. This study also suggests that recent cohorts' marital patterns and fertility histories will lead to an elderly population in the future that is more likely to be living alone and less likely to have family caregivers.

The future roles of individuals, families, and society with respect to the older population are unknown. What is needed to educate the public about long-term physical and economic effects of lifestyle in younger years? Who will care for the physically and economically dependent aged? Will care programs take into account cultural differences? Will older persons be able to pay a larger proportion of the costs of their old age? What is the proper funding balance between research to prevent nonfatal chronic illness and research to prevent and treat killer diseases? For example, one recent simulation study determined that reductions in arthritis would result in much greater savings in future disability than similar reductions in stroke, diabetes, heart disease, or cancer.

This report generally describes the older population of the 1990's. Some historical trends and future projections of the older population also are discussed. Today's older population looks very different from the older population of the past. The older population of tomorrow will not look the same as today's elderly. Current lifestyle choices of younger persons will affect their life prospects at older ages. Looking at the characteristics of younger cohorts can help to predict change. Educational attainment is much higher for the Baby-Boom generation, for example, and we know that the elderly of tomorrow will have higher educational attainment levels than present-day elderly. Many predictions have been made for the Baby-Boom generation as they age, and in a few decades their characteristics will, of course, become those of the elderly. Still, health and economic status characteristics of the elderly of tomorrow are particularly problematic to predict. For example, we cannot simply use the characteristics and attitudes of the current generation of the elderly to predict future labor prospects for the older population. The Baby-Boom generation is quite different. Their health is generally better, their educational attainment higher, and most women work. Their attitude towards retirement may differ and their pension plans are increasingly dependent on individual contributions. The age for receiving full benefits for retirement may move upward. Each of these factors complicates the drawing of an accurate portrait of the older population's labor force characteristics.

While we can be confident that the United States will experience a "boom" in the absolute size and growth rate of the elderly population, as well as increased diversity and an increased proportion oldest old of the total elderly population, some characteristics of the elderly of tomorrow are less predictable. What will happen if large numbers of people have Alzheimer's disease, for example? Is it inevitable? Preventable? The continued study of the genetic, biochemical, and physiologic aspects of aging is certain to alter the future world of the elderly. Ongoing scientific research advances are beginning to identify "the basic biological mechanisms that control aging" and to clarify "the differences between normal aging processes and disease states". In the future, one outlook is that "older Americans can expect to stay healthy for more of their later years". "It is likely that several factors will work to reduce disability among the elderly, including improved health, new forms of service delivery, and improved technology." Perhaps the human life span will be extended. It has been suggested that such research will "very certainly contribute to better health, less disability, and more independence in the second fifty years of life".

On balance, our knowledge of the elderly population in the United States has increased phenomenally over the past two decades. Regarding the future elderly, their growth explosion, increased diversity, and increasing proportion of oldest old will influence the society of tomorrow. Our ability to understand and describe the future elderly varies considerably, depending on their demographic, social, health, or economic

characteristics. Data, methodology, and research on the older population continue to improve and evolve, leading us toward a clearer view of the profile of tomorrow's elderly. As individuals, families, and a nation, our current and expected gains in understanding will provide us with informed opportunities to make appropriate adjustments to effectively meet the challenges and needs associated with our aging society.

参考译文

在世界上所有的国家当中，美国以其人口多样性而著称，包括老年人口多样性。在未来几年里人口多样性还会增加。在老年人口中，就他们的健康和社会经济的特点而言，各年龄段的老年人之间都存在着重要的差异。在未来数十年，高龄老人(85岁及以上)在老年人总数中所占比例将会增加。未来人口变迁的速度和进程将为个人、家庭和政府带来引人注目的社会、经济和道德的选择。“人们只能猜测人口变迁的确切数目、方向、速度以及这样的社会和人口变迁对美国未来一代的协同效应。其实更加令人难以估计的是，在技术和法律环境方面的变化将会如何加剧或者缓和这些问题。”

未来，老年人口数量的增长是不可避免的，而且这一现象在世界各地都将会产生。特别是在发达国家，我们可以期待，放在青年身上的传统注意力会少一些。我们已开始面对即将发生的问题，并就一些重要问题寻求解决方案。在发达国家已经出现了一些道德和老龄化的问题，例如：什么是安乐死和终止生命治疗的道德、伦理的界限；是否应该在以年龄为基础的配给制度之上提供卫生服务；谁能判断病人在决策方面的能力水平。他们今天做出的决定以及他们在这些方面以及其他与老龄化相关的领域所选择的方向，将直接影响我们在未来几十年里的生活质量和活力。

我们面临着老年人口增加和老年人口日益高龄化所带来的许多问题。其中一些最紧迫的问题是：未来一代的老年人是否会健康；他们能否独立；社会是否会为他们提供富有成效和目的明确的角色。还有关于未来老年人口的问题，例如，是否会有更多的老年人将长期处于丧失能力的状态或者他们患慢性病的年龄是否将推迟，这些问题仍然没有答案。

当就老年人口的规模、结构和健康的准确预测对计划公共和个人活动来说是必不可少的时候，数据和方法上的不足在某种程度上限制了研究人员去解答一些有关老年人未来的死亡率、发病率和健康的问题。例如，考虑到多方面的原因，准确预测非正常死亡的死亡率取决于一些重要的统计报告中增多的死亡人数的数据。人类发病率和由年龄造成的发病死亡率模型的发展水平甚至比寿终正寝的死亡率模型水平还要低。

未来与老年人口相关的个人、家庭和社会的角色问题还有待解答。如何教育公众年轻时的生活方式对身体和经济的长期影响？谁来照顾身体和经济上需要依赖他人的老人？护理项目会将文化差异考虑在内吗？老年人能够在他们晚年支付一笔较大的费用吗？如何在预防非致命慢性疾病方面的研究和预防及治疗致命性疾病的研究之间保持适当的资金平衡呢？举例来说，最近的一项模拟研究发现，患关节炎的人数比患中风、糖尿病、心脏病或

癌症的人数减少得更多，这一现象将为挽救老年人身体失能起到更大帮助。

这份报告主要介绍了20世纪90年代的老年人口情况，也讨论了老年人口的一些历史趋势和对未来的预测。老年人口今非昔比，明天的老年人口也会不同于今天的老年人口。年轻人目前选择的生活方式将会影响他们年老时对生活的展望。研究年青一代人的特点可以帮助预测未来的变化。例如，在生育高峰期出生的一代受教育的程度要高得多，而且我们知道将来的老年人会比当今的老年人拥有更高的教育水平。已经有人对在生育高峰期出生的一代年老时的状况做了许多预测，数十年后，他们的特点当然将会变成老年人的特点。然而，未来老年人的健康和经济地位的特征却很难预测。举例来说，我们不能简单地使用目前这一代老人的特点和态度来预测未来老年人劳动力的前景。在生育高峰期出生的一代颇为不同。他们的健康状况普遍较好，受教育程度也较高，大多数妇女都在工作。他们对待退休的态度也许也有所不同，他们得到的养老金越来越依赖于个人所作的贡献。接受退休带来的所有利益的老年人的年龄也许会上移。每一个因素都使准确地描绘出老年人口的劳动力特点这一问题变得错综复杂。

虽然我们可以确信美国将在老年人的绝对规模、增长速度、增加的多样性以及高龄老人在老年人总数中所占比例上都将经历一次“高峰”，但未来老年人的某些特征还是较难预测。例如，如果大量老年人患痴呆症，将会怎样呢？这是否不可避免？还是可以预防？对老龄化的遗传、生化和生理方面的继续研究一定会改变老年人的未来世界。正在进行的科研进展正开始确定“控制人体变老的基本生物机制”，并弄清“正常老龄化过程和处于疾病状态下的老龄化之间的差异”。在未来，一个可以展望的前景就是“美国老年人可以期待在晚年保持更长久的健康”。“有几个因素在减少老年人的身体失能这一方面将有可能起作用，包括改善健康、提供新形式的服务和改进技术。”或许人类的生命周期将会延长。曾有人表示，这类研究将“一定有助于改善健康，减少身体失能，使人们在生命的第二个50年更加独立”。

核心词汇

ethical ['eθikəl] *adj.* 伦理的，道德的
synergistic ['sinədʒistik] *adj.* 协同的，协作的
cohort ['kəuhɔ:t] *n.* 同辈，一群
milieu ['mi:ljə:] *n.* 周围，环境
pertaining [pə(:)'teiniŋ] *adj.* 有关系的
euthanasia [ˌju:θə'neiziə] *n.* 安乐死
onset ['ɔnset] *n.* 攻击，进攻
postpone [pəust'pəun] *vt.* 推迟，延期
methodological [ˌmeθədə'lɔdʒikəl] *adj.* 方法的
morbidity [mɔ:'biditi] *n.* 病态
nonfatal [ˌnɔn'feitəl] *adj.* 非致命的
diabetes [ˌdaiə'bi:ti:z] *n.* 糖尿病
attainment [ə'teinmənt] *n.* 成就，造诣
retirement [ri'taiəmənt] *n.* 退休

Health: How to Train Your Brain

10. 健康：如何锻炼你的大脑

机经选粹

这一篇讲的是大脑像人的身体一样也可以经过锻炼，以提高人们解决问题的能力、创造力等。

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Health: How to Train Your Brain

Worried you're losing your marbles? The latest computer games are designed to help. Rebecca Armstrong flexes her grey matter.

We all know what we should do to increase physical fitness. But how can we increase the fitness of our brains? While taking your mind for a jog isn't an option, giving it regular exercise is. The concept of training your brain is gaining credibility, and now it's become the computer games industry's latest big idea, with four new games just out to help people to flex their mental muscles.

Whether you choose to try to reduce the age of your brain to 20 (purported to be the ideal brain age in Nintendo's How Old is Your Brain?), or make your brain bigger by using another Nintendo game, Big Brain Academy, or improve your "Practical Intelligence Quotient" and post your score with the help of a Sony games title, there's no shortage of new ways to train your brain.

What is brain training?

Recent research suggests that everything from absentmindedness to arithmetic skills can be improved by playing certain intelligence and memory-stimulating activities. Scientists and neuroexperts believe puzzles that rely on problem-solving,

memory and logical deduction can be highly beneficial for the brain by making people approach tasks in a more flexible way. A widely held belief used to be that the brain only lost cells as it got older. Now it's known that people can acquire new brain cells throughout their lives, provided their brains are stimulated.

According to the Society for Neuroscience, remembering lists of facts or keeping day-to-day information in your mind is different from memorising things in the long term. To do this, you have to exercise your brain. One way is to play a dedicated computer game such as Nintendo's, How Old is Your Brain? or Big Brain Academy. Typical tasks in How Old is Your Brain? could be counting the syllables in a sentence to completing 20 simple sums as quickly as possible.

How does it work?

Dr Ryuta Kawashima, the neuroscientist who is behind the Brain Trainer device (which is like a large calculator but with simple graphics and sound) and the Nintendo Dual Screen (DS) title Brain Training: How Old is Your Brain? explains how it all works. "Simple mathematical calculations and saying answers out loud activates the brain, particularly the prefrontal cortex which governs the most essential living functions for humans, such as cognition, emotion and memory, and enables the maintenance and improvement of brain functions."

Nintendo's DS hand-held games console has one screen that's touch sensitive and is "drawn" or written on using a stylus, and another that displays information and instructions. Users hold the device like an open book. Like Dr Ryuta Kawashima, Dr Sarah-Jayne Blake-More, a cognitive neuroscientist and author of *The Learning Brain*, thinks that this really will help to make your brain more active.

"When you're stimulating your brain, it is more active and can even grow brain cell connections. If you teach people to play the piano, the part of the brain that controls finger movements increases and is more active. That's the idea behind brain training."

Why now?

Dr Blakemore says there are two reasons for the interest in brain training. "People are living longer, so they are noticing that their memories are going sooner, or they' re aware of it over a longer period. They care about that because there's more awareness of about brain health. There's also scientific evidence showing that training your brain improves it."

What do the experts say?

Specialists agree that exercising your brain is a good thing. Dr Kawashima says: "If you don't use your brain, it will age quickly. You'll have a brain with less power than



the ideal brain age of 20. But you can train your brain just like your body."

Psychologist Professor Walter Furneaux agrees that this kind of mental stimulation is valuable. "It's true to say that almost any mental rehearsal can be useful to improve memory and mental agility. While I don't know of any specific results about these games, it would be interesting to do some serious work on them."

Dr Marshall D Voris conducted a study using the brain-training exercises available at www.my-braintrainer.com, a website that offers daily challenges to keep the minds of its online users alert. He claims that "the MyBrainTrain-er.com exercises increased IQ, reduces anxiety, and improves cognitive efficiency and speed".

Who should do it?

It's said that doing puzzles can slow the onset and progression of Alzheimer's disease and improve mental capacity in the young. According to a study into the effects of Alzheimer's by the Case Western Reserve University in the United States, middle-aged people who kept active, mentally or physically, were less likely to develop the disease in later life. Activities such as gardening, playing a musical instrument or exercising were found to be the most successful in helping to prevent the disease.

How do I train my brain?

Dr Blakemore cautions there's only so much any exercise can do. "If you play the Nintendo game or solve crossword puzzles you become better at those tests but you're not suddenly going to become a brilliant cook or something. It's very specific."

So you may be able to boost your IQ by a point, but the great novel may take a little more time.

Low-Tech Brain Workouts

Solve Puzzles

Riddles, crosswords, sudoku and scrabble are all reported to greatly improve brain function and memory, and decrease mental decline.

Get Plenty of Sleep

Aim to get eight to nine hours of sleep regularly. Being awake for 21 hours straight decreases your mental agility to that of someone who has been drinking.

Don't Skip Breakfast

Those who miss breakfast have far lower levels of concentration. For best results, eat within an hour of waking up and choose food high in fibre, protein and carbohydrate.

Get Plenty of Exercise

Physical activities are proven to improve abstract thinking and concentration, promoting the growth of brain cells.

Learn Another Language

Language learning provides a great mental workout, forcing your brain to switch tracks constantly. It also helps tone the frontal lobes, which decline with age.

Break Your Routine

Breaking at least two habitual actions a day keeps your brain active. Try altering your route to work or using your "wrong" hand for your mouse.

Eat Well

Scientists recommend sunflower seeds, dark berries, unrefined grain foods (brown rice, pasta and whole meal bread), oily fish and minimal amounts of caffeine.

Drink Plenty of Water

Aim for eight glasses every day—dehydration can affect concentration levels.



你担心失去理智吗？一种最新被设计出来的电脑游戏可以帮助你。丽贝卡·阿姆斯壮就锻炼了智力，使头脑灵活了。

我们都知道应该做些什么来促进身体健康。但是，如何促进大脑的健康呢？不要让你的大脑想像力随意徜徉，而是要进行有规律的训练。训练你的大脑这个观念越来越具有可信度，现在变成了电脑游戏产业最新的伟大计划，新问世了4个游戏来帮助人们训练大脑肌肉。

不管你是选择试着将大脑年龄减至20岁(在"你的脑龄多大了？"这款电脑游戏中，20岁是理想的大脑年龄)还是通过使用另一种电脑游戏"大脑学院"来增加你的脑容量？还是要提高你的"实际智商"并在索尼的电脑游戏的帮助下得分？你并不缺少训练大脑的新方法。

什么叫大脑训练？

最近一项研究表明，从心不在焉到算术技巧的演练，每一件事都能通过玩这种刺激智力和记忆的电脑游戏得到提高。科学家和神经专家相信，通过让人们以一种更灵活有效的方式来处理问题，那么人们对解决问题、记忆和逻辑推算的迷惑可以对大脑更加有利。过去人们广泛认为，在大脑衰老过程中，大脑失去的仅仅只是细胞。现在人们知道，在人的一生中，只要大脑接受到刺激，就可以获得新的大脑细胞。

根据神经科学协会称，记住一系列事实或者是你的大脑能够保留日常信息与长期记忆

是不同的。为了做到这一点，你得训练大脑。其中一种方式就是玩专门的电脑游戏，如"任天堂"、"你的脑龄多大了？"或者是"大脑学院"。"你的脑龄多大了"这个游戏中的典型任务就是数一句话中的音节数，尽可能快地完成20道简单的题目。

它是如何运作的?

川岛隆太博士，在大脑训练设备(它就像一个大的计算器，但是有简单的图表和声音)和"任天堂双屏幕游戏机"幕后的神经系统科学家，他把"训练大脑"称为：你的脑龄多大？并解释它如何运作。"简单的数学计算和大声地回答问题能够使大脑活动起来，尤其是前额的大脑皮层，这个皮层掌管着人类大多数重要的生命功能，例如，认知力、情绪和记忆，并能使大脑功能得到维持和提高。"

"任天堂"的双屏手提式小型游戏机，其中有一个屏幕触及敏感区，并被"拔出"或用指示笔写下来，另一个屏幕则显示消息报告和指示。用户使用这个游戏设备就像使用一本翻开的书一样。像川岛隆太博士一样，萨拉洁妮・布莱克摩尔博士，一个认知学的神经系统科学家兼《学习大脑》这本书的作者，她也认为这个游戏确实能使你的大脑更加活跃。

"当你正在刺激你的大脑时，大脑就会更加的活跃，甚至能够促进大脑细胞的连接。如果你教人们弹钢琴，你大脑中控制手指运动的那一部分就会增强而且会变得更活跃。这就是隐藏在大脑训练背后的一些观点。"

为什么是现在呢?

布莱克摩尔博士认为，人们对训练大脑感兴趣的原因有2个。"人们的寿命越来越长，因此他们注意到记忆也会消失得更快，或者说他们会在更长一段时间内意识到这一点。他们关注的是，人们对大脑的健康有更多的认识，也有一些证据表明训练你的大脑能够使大脑更健康。

专家们怎么说?

训练大脑是一件好事，专家们都同意这一观点。川岛博士说："如果不使用大脑，大脑很快会衰老，大脑会比一个处于20岁理想脑龄的大脑的功能要差。但是，你可以像训练身体那样训练大脑。"

心理学教授瓦尔特・弗尔努同意说，这种对脑力的刺激是非常宝贵的。"几乎任何一种脑力练习都对提高记忆力和大脑的敏捷度是非常有用的，这样说是千真万确的。虽然我不知道这些游戏能产生什么特别的结果，但在这上面做一些认真的研究工作会是很有趣的。"

马歇尔・瓦瑞斯博士通过www.my-braintrainer.com网站上可供使用的训练大脑的练习，进行了一项研究，这个网站提供日常对脑力训练的挑战以使在线使用者的大脑保持灵敏。他声称"My-BrainTrainer.com这个网站上的练习能够提高智商，减少忧虑，提高认知的有效性和速度。"

谁该这样做?

据说，解决难题能够减缓阿尔茨海默氏病的侵袭和发展，也能够改善年轻人的心智能量。根据美国西储大学对阿尔茨海默氏病的影响的一项研究表明，能够在精神上和身体上积极活跃的中年人不大可能在晚年患这种病。他们发现像园艺、弹奏乐器和锻炼这样的活动在帮助避免患上这类疾病方面是最成功的。

如何训练大脑?

布莱克摩尔博士警告到，训练大脑你能够做的就只有这些。"如果你在玩'任天堂'或是在玩纵横填字谜游戏的时候，你会逐渐擅长于这个游戏，但是你不会突然变成一个很

优秀的厨师或是其他的人物。这是很特别的一点。”

这样做你的智商指数可能会提高一个点，但是阅读伟大的长篇小说将会花费较多的时间。

低技术的脑训练

解决难题

谜语、纵横填字谜游戏、九宫数独游戏和拼字游戏被描述成能够在很大程度上促进大脑功能和记忆方法，并减缓智力下降。

获得足够的睡眠

目的是为了获得8~9个小时有规律的睡眠。每天有21个小时没有睡眠就会直接导致大脑的敏捷度降低，就像喝了酒一样。

不要不吃早餐

那些不吃早餐的人注意力集中的水平会降低。最好的结果就是在起床后1个小时之内吃早餐，要选择那种富含纤维、蛋白质和碳水化合物的食物。

进行大量的运动

身体的活动被证明能够增强人的抽象思维能力并能帮助集中注意力，促进大脑细胞的生长发育。

学习另一种语言

学习一种新的语言会给大脑带来很大的脑力工作量，能让大脑集中并迅速转换思维方式。它也会帮助强健的额叶——随着年龄的增长而功能降低。

打破你的日常习惯

每天打破至少2个习惯行为能够使你的大脑保持活跃。试着改变上班路径或是使用“错”手来向嘴里送饭。

要吃好

科学家建议要多吃葵花籽、深色的浆果、未精制的谷类食物(糙米、面食和全麦面包)、油性鱼类和少量的咖啡因。

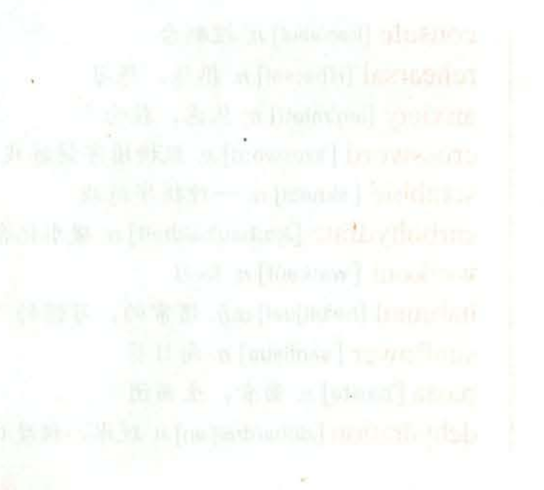
多喝水

每天要喝8杯水——脱水会影响你的大脑注意力集中的程度。

核心词汇

jog [dʒɔg] *n.* 漫步，徜徉
quotient ['kwəuʃənt] *n.* 商，商数
absentmindedness ['æbsənt'maindidnis] *n.* 精神不集中(心不在焉)
syllable ['siləbl] *n.* 音节
neuroscientist [ˌnjuərəu'saiəntist] *n.* 神经系统科学家
graphics ['græfiks] *n.* 制图法，制图学
prefrontal [pri:'frʌntl] *adj.* 前额的
console [kən'səul] *n.* 控制台
rehearsal [ri'hə:səl] *n.* 排练，练习
anxiety [æŋ'zaiəti] *n.* 焦虑，挂念
crossword ['krɔswə:d] *n.* 纵横填字谜游戏
scrabble ['skræbl] *n.* 一种拼字游戏
carbohydrate [ˌkɑ:bəu'haidreit] *n.* 碳水化合物
workout ['wə:kaut] *n.* 练习
habitual [hə'bitjuəl] *adj.* 惯常的，习惯的
sunflower ['sʌnflauə] *n.* 向日葵
pasta ['pæstə] *n.* 面食，生面团
dehydration [ˌdi:hai'dreiʃən] *n.* 脱水，极度口渴







第四章

自然环境类

Are We on the Brink of a "New Little Ice Age"?

1. 我们正面临一个"新的小冰河世纪"？

机经选粹

这一篇讲地球冰河时期对现在气候的影响。

阅读题源

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Are We on the Brink of a "New Little Ice Age"?

When most of us think about Ice Ages, we imagine a slow transition into a colder climate on long time scales. Indeed, studies of the past million years indicate a repeatable cycle of Earth's climate going from warm periods ("interglacial", as we are experiencing now) to glacial conditions.

The period of these shifts are related to changes in the tilt of Earth's rotational axis (41,000 years), changes in the orientation of Earth's elliptical orbit around the sun, called the "precession of the equinoxes" (23,000 years), and to changes in the shape (more round or less round) of the elliptical orbit (100,000 years). The theory that orbital shifts caused the waxing and waning of ice ages was first pointed out by James Croll in the 19th Century and developed more fully by Milutin Milankovitch in 1938.

Ice age conditions generally occur when all of the above conspire to create a minimum of summer sunlight on the arctic regions of the earth, although the Ice Age cycle is global in nature and occurs in phase in both hemispheres. It profoundly affects distribution of ice over lands and ocean, atmospheric temperatures and circulation,

and ocean temperatures and circulation at the surface and at great depth.

Since the end of the present interglacial and the slow march to the next Ice Age may be several millennia away, why should we care? In fact, won't the build-up of carbon dioxide (CO_2) and other greenhouse gasses possibly ameliorate future changes?

Indeed, some groups advocate the benefits of global warming, including the Greening Earth Society and the Subtropical Russia Movement. Some in the latter group even advocate active intervention to accelerate the process, seeing this as an opportunity to turn much of cold, austere northern Russia into a subtropical paradise.

Evidence has mounted that global warming began in the last century and that humans may be in part responsible. Both the Intergovernmental Panel on Climate Change (IPCC) and the US National Academy of Sciences concur. Computer models are being used to predict climate change under different scenarios of greenhouse forcing and the *Kyoto Protocol* advocates active measures to reduce CO_2 emissions which contribute to warming.

Thinking is centered around slow changes to our climate and how they will affect humans and the habitability of our planet. Yet this thinking is flawed: It ignores the well-established fact that Earth's climate has changed rapidly in the past and could change rapidly in the future. The issue centers around the paradox that global warming could instigate a new Little Ice Age in the northern hemisphere.

Evidence for abrupt climate change is readily apparent in ice cores taken from Greenland and Antarctica. One sees clear indications of long-term changes discussed above, with CO_2 and proxy temperature changes associated with the last ice age and its transition into our present interglacial period of warmth. But, in addition, there is a strong chaotic variation of properties with a quasi-period of around 1,500 years. We say chaotic because these millennial shifts look like anything but regular oscillations. Rather, they look like rapid, decade-long transitions between cold and warm climates followed by long interludes in one of the two states.

The best known example of these events is the Younger Dryas cooling of about 12,000 years ago, named for arctic wildflower remains identified in northern European sediments. This event began and ended within a decade and for its 1000 year duration the North Atlantic region was about 5°C colder.

The lack of periodicity and the present failure to isolate a stable forcing mechanism, has prompted much scientific debate about the cause of the Younger Dryas and other millennial scale events. Indeed, the Younger Dryas occurred at a time when orbital forcing should have continued to drive climate to the present warm state.

A whole volume that reviews the evidence for abrupt climate change and speculates on its mechanisms was published recently by an expert group commissioned by the National Academy of Sciences in the US.



This very readable compilation contains a breadth and depth of discussion that we cannot hope to match here.

Presently, there is only one viable mechanism identified in the report that may play a major role in determining the stable states of our climate and what causes transitions between them: It involves ocean dynamics.

In order to balance the excess heating near the equator and cooling at the poles of the earth, both atmosphere and ocean transport heat from low to high latitudes. Warmer surface water is cooled at high latitudes, releasing heat to the atmosphere, which is then radiated away to space. This heat engine operates to reduce equator-to-pole temperature differences and is a prime moderating mechanism for climate on Earth.

Warmer ocean surface temperatures at low latitudes also release water vapor through an excess of evaporation over precipitation to the atmosphere, and this water vapor is transported poleward in the atmosphere along with a portion of the excess heat. At high latitudes where the atmosphere cools, this water vapor falls out as an excess of precipitation over evaporation. This is part of a second important component of our climate system: the hydrologic cycle. As the ocean waters are cooled in their poleward journey, they become denser. If sufficiently cooled, they can sink to form cold dense flows that spread equatorward at great depths, thus perpetuating the circulation system that transports warm surface flows toward high latitude oceans.

The cycle is completed by oceanic mixing, which slowly converts the cold deep waters to warm surface waters. Thus, surface forcing and internal mixing are two major players in this overturning circulation, called the great ocean conveyor.

The waters moving poleward are relatively salty due to more evaporation at low latitudes, which increases surface salinity. At higher latitudes surface waters become fresher as a consequence of the dominance of precipitation over evaporation at high latitudes.

The freshening tendency makes the surface water more buoyant, thus opposing the cooling tendency. If the freshening is sufficiently large, the surface waters may not be dense enough to sink to great depths in the ocean, thus inhibiting the action of the ocean conveyor and upsetting one important part of the earth's heating system.

This system of regulation does not operate the same in all oceans. The Asian continent limits the northern extent of the Indian Ocean to the tropics, and deep water does not presently form in the North Pacific, because surface waters are just too fresh. Our present climate promotes cold deep water formation around Antarctica and in the northern North Atlantic Ocean. The conveyor circulation increases the northward transport of warmer waters in the Gulf Stream at mid-latitudes by about 50% over what wind-driven transport alone would do.

Our limited knowledge of ocean climate on long time scales, extracted from the analysis

of sediment cores taken around the world ocean, has generally implicated the North Atlantic as the most unstable member of the conveyor: During millennial periods of cold climate, North Atlantic Deep Water (NADW) formation either stopped or was seriously reduced. And this has generally followed periods of large freshwater discharge into the northern N. Atlantic caused by rapid melting of glacial or multi-year ice in the Arctic Basin. It is thought that these fresh waters, which have been transported into the regions of deep water formation, have interrupted the conveyor by overcoming the high latitude cooling effect with excessive freshening.

The ocean conveyor need not stop entirely when the NADW formation is curtailed. It can continue at shallower depths in the N. Atlantic and persist in the Southern Ocean where Antarctic Bottom Water formation continues or is even accelerated. Yet a disruption of the northern limb of the overturning circulation will affect the heat balance of the northern hemisphere and could affect both the oceanic and atmospheric climate. Model calculations indicate the potential for cooling of 3 to 5 degree Celsius in the ocean and atmosphere should a total disruption occur. This is a third to a half the temperature change experienced during major ice ages.

These changes are twice as large as those experienced in the worst winters of the past century in the eastern US, and are likely to persist for decades to centuries after a climate transition occurs. They are of a magnitude comparable to the Little Ice Age, which had profound effects on human settlements in Europe and North America during the 16th through 18th centuries. Their geographic extent is in doubt; it might be limited to regions bounding the N. Atlantic Ocean. High latitude temperature changes in the ocean are much less capable of affecting the global atmosphere than low latitude ones, such as those produced by El Nino.

Whether the pathway for propagation of climate change is atmospheric or oceanic, or whether changes in oceanic and terrestrial sequestration of carbon may globalize effects of climate change, as suspected for glacial/inter-glacial climate changes, are open questions. Yet we begin to approach how the paradox mentioned above can happen: Global warming can induce a colder climate for many of us.

Consider first some observations of oceanic change over the modern instrumental record going back 40 years. During this time interval, we have observed a rise in mean global temperature. Because of its large heat capacity, the ocean has registered small but significant changes in temperature. The largest temperature increases are in the near surface waters, but warming has been measurable to depths as great as 3,000 meters in the N. Atlantic. Superimposed on this long-term increase are interannual and decadal changes that often obscure these trends, causing regional variability and cooling in some regions, and warming in others.

In addition, recent evidence shows that the



high latitude oceans have freshened while the subtropics and tropics have become saltier. These possible changes in the hydrological cycle have not been limited to the North Atlantic, but have been seen in all major oceans. Yet it is the N. Atlantic where these changes can act to disrupt the overturning circulation and cause a rapid climate transition.

A 3~4 meter, high latitude buildup of fresh water over this time period has decreased water column salinities throughout the subpolar N. Atlantic as deep as 2, 000m. At the same time, subtropical and northern tropical salinities have increased.

The degree to which the two effects balance out in terms of fresh water is important for climate change. If the net effect is a lowering of salinity, then fresh water must have been added from other sources: river runoff, melting of multi-year arctic ice, or glaciers. A flooding of the northern Atlantic with fresh water from these various sources has the potential to reduce or even disrupt the overturning circulation.

Whether or not the latter will happen is the nexus of the problem, and one that is hard to predict with confidence. At present we do not even have a system in place for monitoring the overturning circulation.

Models of the overturning circulation are very sensitive to how internal mixing is parameterized. Recall that internal mixing of heat and salt is an integral part of overturning circulation. One recent study shows that for a model with constant vertical mixing, which is commonly used in coupled ocean-atmosphere climate runs, there is only one stable climate state: our present one with substantial sinking and dense water formation in the northern N. Atlantic.

With a slightly different formulation, more consistent with some recent measurements of oceanic mixing rates that are small near the surface and become larger over rough bottom topography, a second stable state emerges with little or no deep-water production in the northern N. Atlantic. The existence of a second stable state is crucial to understanding when and if abrupt climate change occurs. When it occurs in model runs and in geological data, it is invariably linked to rapid addition of fresh water at high northern latitudes.

And now perhaps you begin to see the scope of the problem. In addition to incorporating a terrestrial biosphere and polar ice, which both play a large role in the reflectivity of solar radiation, one has to accurately parameterize mixing that occurs on centimeter to tens of centimeter scales in the ocean. And one has to produce long coupled global climate runs of many centuries! This is a daunting task but is necessary before we can confidently rely on models to predict future climate change.

Besides needing believable models that can accurately predict climate change, we also need data that can properly initialize them. Errors in initial data can lead to poor atmospheric predictions in several days. So one sure pathway to better weather predictions is better initial data.

For the ocean, our data coverage is wholly inadequate. We can't say now what the

overturning circulation looks like with any confidence and are faced with the task of predicting what it may be like in 10 years!

Efforts are now underway to remedy this. Global coverage of upper ocean temperature and salinity measurements with autonomous floats is well within our capability within the next decade as are surface measures of wind stress and ocean circulation from satellites.

The measurement of deep flows is more difficult, but knowledge about the locations of critical avenues of dense water flows exists, and efforts are underway to measure them in some key locations with moored arrays.

Our knowledge about past climate change is limited as well. There are only a handful of high-resolution ice core climate records of the past 100,000 years, and even fewer ocean records of comparable resolution. Better definition of past climate states is needed not only in and of itself, but for use by modelers to test their best climate models in reproducing what we know happened in the past before believing model projections about the future. We are not there yet, and progress needs to be made on both better data and improved models before we can begin to answer some critical questions about future climate change.

Researchers always tell you that more research funding is needed, and we are not any different. Our main message is not just that, however. It is that global climate is moving in a direction that makes abrupt climate change more probable, that these dynamics lie beyond the capability of many of the models used in IPCC reports, and the consequences of ignoring this may be large. For those of us living around the edge of the N. Atlantic Ocean, we may be planning for climate scenarios of global warming that are opposite to what might actually occur.

参考译文

一想到冰河时期，我们绝大多数人会猜想应该是经过很长一段时期之后，气候慢慢变冷。的确，对过去几百万年来地球气候变化的研究显示：地球上的气候变化是冷暖交替重复循环的，目前正从温暖期（"间冰期"，即我们现在正处的阶段)向冰河时期转变。

冷暖交替的周期与下列变化有关：地球自转轴的倾斜度(4.1万年周期)；地球绕太阳公转的椭圆形轨道的方向，即"分点岁差"(2.3万年周期)；椭圆形轨道(10万年周期)的形状(圆一点或扁一点)。19世纪詹姆士·克洛尔首次提出了地球公转轨道的偏移导致了冰河时期的消长这一理论。1938年，米卢丁·米兰克沃维奇使这一理论更加完善。

虽然本质上冰河时期的周期是全球性的，并且在2个半球交替出现，但是当上述

种种变化共同导致地球两级地区夏季日照量降低到最小值时，出现冰河时期情况的概率最高。它会显著影响陆地上和海洋中冰块分布、大气温度和大气循环、以及海洋表层区和深层区的温度及其循环。

既然我们现在所处的间冰期离下一个冰河时期间隔几千年，那么我们为什么还要担心呢？实际上，逐渐增多的二氧化碳和其他温室气体有没有可能对将来的变化有所改善呢？

的确，一些组织，包括绿色地球协会和俄罗斯亚热带化运动，认为全球变暖对人们的生活是有益的。俄罗斯亚热带化运动的一些人甚至提倡人为积极地加速全球变暖进程，从而使得寒冷贫瘠的俄罗斯北部变成亚热带天堂。

越来越多的证据表明，全球变暖始于上个世纪，而且人类对此负有一定的责任。联合国政府间气候变化工作小组和美国国家科学院都同意这一观点。人们正在运用计算机模型预测在不同的强迫性的温室作用下气候发生的变化。由于二氧化碳能够导致气候变暖，《京都协定书》提倡人们采取积极措施减少二氧化碳排放量。

人们现在最为关注的是，气候发生的缓慢变化以及这些变化对人类和地球可居住性的影响。但是这一想法并非无懈可击：它忽视了这样一个早已为大家所认可的事实——过去地球气候变化迅速，将来也可能变化很快。全球气候变暖会导致北半球出现一个新的小冰河期，这是一个自相矛盾的说法，也是人们现在争论的焦点。

气候可以在很短的时间内出现剧烈的变化这一事实已经可以通过从格陵兰岛和南极洲钻取到的冰核中得以证实。在上一次冰河时期，以及从那时到现在我们所处的温暖的间冰期的转换期间，二氧化碳以及相应的温度指标都发生了变化。通过这些变化，我们可以清楚地看到长期以来气候变化、冷暖交替出现的迹象。但是，气候变化每隔一个时期另外就会经历一个非常混乱的时期，这个准周期大约是1,500年。之所以说它们混乱，是因为这些气候变化数千年循环一次，看起来仅仅像是一次次常规的气候震荡。更确切地说，它们可以在冷暖气候间交替快速的转变，并且可以持续长达10年之久，之后地球处于冗长的寒冷的冰河时期或温暖的间冰期。

最为著名的例子就是1.2万年前发生的“新仙女木”降温事件，它的名字来源于北极的一种野花。在北欧大陆的沉积物里，我们依然可以发现有关这次事件的痕迹。这一事件从开始到结束持续了10年，在此后长达1，000年的时间里，北大西洋地区的温度低了5度。

混乱期的冷暖交替并没有固定的爆发周期，而且我们现在也无法单独分离出一种稳定的促使其变化的强迫机制，为此科学界针对“新仙女木”事件和其他数千年一次的气候变化事件的起因展开了许多争论。确实，“新仙女木”事件发生在天文轨道力应该继续驱使气候向现在的温暖期转化的期间。

美国国家科学院委任了一个专家组，对气候突变的证据进行了很多次评审，对其机制也进行了大量的推测，并于近期发表了一份相关报告。该报告在讨论的广度和深度上都是本文无法企及的，非常值得一读。

目前，专家们在报告中只认同一种可行的机制。该机制在决定地球到底是处于冰河期还是间冰期以及促使它们之间转变的原因上可能起着非常重要的作用。该机制涉及海洋动力学知识。

赤道附近的气候过于炎热，两级地区又过于寒冷。为了平衡这2种气候，大气和海洋洋流都是从低纬度向高纬度运动。

温暖的表层海水在高纬度地区冷却下来，同时向大气中释放热量，该热量后来又散发到太空中。这种热力发动机的运行缩小了赤道和极地地区间的温差，成为地球上气候变化主要的缓和调节机制。

当低纬度地区的海水蒸发量大于降水量时，温暖的海洋表层释放出水蒸气。这些水蒸气和一部分过剩的热量一起向极地方向移动。当水蒸气运行到高纬度地区时，大气温度降低，水蒸气形成雨水降下来，在这里降水量要大于蒸发量。这是气候系统中的第二大要素：水文循环。海水向极地移动时，温度渐渐降低，密度增大。如果其温度降到足够低，会形成强大的冷水流，并在海底深处向赤道方向蔓延，使得温暖的海洋表层水持续循环地流向高纬度海洋。

该循环的最后阶段就是海洋洋流融合，慢慢地将冰冷的海底深层水转换成温暖的表层水。因此表面推动力和内部的水体融合是大洋环流这一倒转循环系统中2个主要角色。

核心词汇

interglacial [ˌintəˈgleiʃəl] *adj.* 间冰期的

glacial [ˈgleiʃəl] *adj.* 冰的，冰川(期)的

rotational [rəuˈteiʃənəl] *adj.* 回转的，轮流的

precession [priˈseʃən] *n.* 岁差

equinox [ˈi:kwinɔks] *n.* 昼夜平分点，春分或秋分

arctic [ˈɑ:ktik] *adj.* 北极的

millennia [miˈleniə] *n.* 一千年（millennium的复数）

austere [ɔsˈtiə] *adj.* 严峻的，严寒的

habitability [ˌhæbitəˈbiləti] *n.* 可居住性

chaotic [keiˈɔtik] *adj.* 混乱的

millennial [miˈleniəl] *adj.* 一千年的

oscillation [ˌɔsiˈleiʃən] *n.* 振动，动摇

wildflower [ˈwaildˌflauə(r)] *n.* 野花

periodicity [ˌpiəriəˈdisiti] *n.* 定期性，周期性

abrupt [əˈbrʌpt] *adj.* 突然的，唐突的

pole [pəul] *n.* 极(点)，极地

moderating [ˈmɔdəritiŋ] *n.* 调节，缓和，减速

vapor [ˈveipə] *n.* 蒸气

evaporation [iˌvæpəˈreiʃən] *n.* 蒸发，脱水

equatorward [iˈkweitəwəd] *adv.* 朝赤道方向地

Scientists Examine the Decline of Florida Bay

2. 科学家们探讨佛罗里达湾环境恶化的原因

机经选粹

这一篇说的是佛罗里达与墨西哥搭界的一个港湾的环境污染及其清除污染措施的讨论，说到3个有关污染原因的理论：一是美国政府改变了该港湾的水流量，二是该地区的水含盐增加，三是水流受到的污染中含有丰富的氮，因此该地区实际是湿地的植物物种改变，以及该港湾的生物物种改变，比如说珊瑚少了很多，后面是对上述原因的确认以及治理污染的措施和政府可能投入的预算。

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Scientists Examine the Decline of Florida Bay

Twenty years after it began its downward spiral, the debate still rages about what is causing big problems in Florida Bay.

The western part of the bay is where the Naples Daily News first reported black water in the spring of 2002, but the problems are older than that by decades.

The crescent-shaped bay between the Florida peninsula and the string of Keys islands was once home to crystal clear water and lush sea grass beds.

Now the turtle grass that suffered a massive die-off in the early 1990s is being replaced by another species that likes nutrient pollution. The patch reefs just north of the middle Keys are barren of lobster that used to crowd under massive boulder corals.

Those corals are dead now, covered in a carpet of smothering green algae, the water often cloudy in an ecosystem that demands clear.

Black water, a phenomenon that scientists link to massive algae blooms and that damages life on the sea floor, has happened a few times since on a smaller scale than the 2002 event.

Professional scuba diver Don DeMaria, who's been here through most of it, doesn't wander up in the bay anymore.

He has enough problems in the reefs to the south where the water quality is better, but not much. This is an interconnected ecosystem after all.

DeMaria used to collect tropical fish for the aquarium market but gave that up because he just couldn't see well enough in the increasingly murky water.

Now DeMaria collects sponges for researchers looking for compounds to cure cancer.

Those hold still and you can feel for them if you have to.

"Years ago all you had to contend with was the wind (to cause cloudy water)," DeMaria said. "Now you have to contend with the wind and the algae blooms."

Depending on who's answering the question about these problems, the answer is as complex as a scientific history lesson or as simple as basic math: take an environment that demands clear, pollution-free water, add nutrients from sewage and agriculture and you get the mess that is Florida Bay and the reefs south of the Keys. The latter are down to 7 percent live coral cover.

The history lesson that largely opposes that viewpoint goes something like this:

Florida Bay wasn't always clear, besides which the redirection of fresh water that once ran to the bay has caused most of the problems. Higher salinity killed the sea grass that in turn decomposed and fed algae blooms.

That idea, held by scientists at the Florida Keys National Marine Sanctuary and Florida International University, holds that while runoff coming from the mainland contains nutrients, there is a question about what happens to those nutrients in the mangroves that fringe the eastern and central bay.

And there is still some debate about which happened first, the algae blooms or the sea grass death.

Brian Keller, science coordinator for the sanctuary and also a member of the Florida Bay Program Management Committee, said managers do look at water quality going into the bay. They just don't happen to agree with other theories about what the water might be doing.

"We're always concerned about the quality part of the quantity, quality, timing and distribution mantra for Everglades restoration," Keller said.

That quality question is in play because the $8.4 billion project that is supposed to save the Everglades by increasing water flows through the river of grass will have

those flows ending up in Florida Bay.

If the quality is not right, the bay could suffer.

Brian Lapointe, senior scientist at Harbor Branch Oceanographic Institution in Fort Pierce, said it already has been since the hypersalinity theory grew wings and led to a demand for more water for the bay.

Critics of the hypersalinity theory, Lapointe chief among them, say it missed the mark because more fresh water was already reaching the bay as early as the 1970s. It was called the Interim Action Plan, during which water that had until then been back-pumped into Lake Okeechobee to keep sugar cane fields dry was instead directed south to Florida Bay.

The interim plan's goal was to keep the lake from crashing under massive algae blooms that resulted from the infusion of nutrients that came with the backpumped water.

It worked for the lake. Not so much for the bay.

Lapointe has been in the basic math camp since the early 1980s when he began a monitoring program for Looe Key, a reef just south of the middle Keys, that continues today.

He says the blooms happened first, and they smothered more than 100,000 acres of turtle grass.

They followed releases of nitrogen-rich water from the Shark River Slough that feeds western Florida Bay.

In a paper he recently published in *The Journal of Experimental Marine Biology and Ecology*, Lapointe said he used nitrogen isotopes to trace the source of the nutrients at Looe Key.

He found that when it rains a lot, the signature is from sewage.

When water releases are high from the mainland into the bay—and flow through the channels between islands to Looe Key—the signature is from agriculture.

Though progress is under way to install a sewer system in the most heavily populated parts of the Keys, the job isn't complete, and many homes still rely on septic tanks that leach nutrients into Keys waters.

Key West has sewers and treats its waste water to remove nutrients before pumping it into an injection well. Stock Island is getting sewers and, as soon as Key West Resort Utilities that is doing the job reaches 100,000 gallons a day, it will go to the same advanced treatment as Key West. The city of Marathon just got 900 homes onto sewer lines with its Little Venice operation, and Islamorada and Key Largo are moving along with plans and a sewer system.

Still, there is the runoff from the mainland to consider.

The Modified Water Deliveries project—called Mod Waters—will be completed in 2006. At that point, engineering changes will flush an additional 4,000 cubic feet per second in a sheet flow of water through the southern Everglades and into Florida Bay.

While the increased water and managed flow might be good for the glades, the water quality, or lack of it, will harm the bay and the reefs, Lapointe has said.

Water managers acknowledge that more water means more nitrogen.

Though the National Academies of Science in August 2002 called for more research into Lapointe's nitrogen question, local water managers have been a bit slower to acknowledge the problem.

But Deevon Quirolo, who, along with her husband, Craig, founded Reef Relief, said there is a glimmer of hope. Reef Relief, a grass-roots effort to save dying reefs, has been fighting alongside Lapointe for such recognition and got their first hint in June that things were going their way.

In a letter, Chip Merriam, deputy executive director of water resources for the South Florida Water Management District, said the district is looking at the possible impacts of nitrogen on the bay and reefs.

"We are definitely making headway," Quirolo said. "This is one of the most difficult challenges we've had. It's a good fight and an important issue, one that will have a huge impact on the survival of the reef."

参考译文

位于佛罗里达半岛和佛罗里达礁岛群之间的月牙形海湾曾经是个海水清澈洁净、海草丰美的胜地。

20世纪90年代早期，海龟草大量死亡，而今已被其他适应如营养盐污染的物种取而代之。佛罗里达礁岛群中部以北的片礁曾经龙虾成群，现在却一只也看不到。

珊瑚礁上覆盖着一层令珊瑚虫窒息的绿色藻类，在这个需要洁净海水的生态系统里，海水却常年浑浊，于是，如今珊瑚虫们都死亡了。

自从2002年发生黑水事件以来，又发生了一些规模相对较小的黑水现象。科学家认为这种黑水现象和大面积藻类种群的爆发息息相关，黑水使海底的生命都受到了损害。

专业深水潜水员丹·德·玛丽尔以前经常在这片海域潜水，现在却再也没来过了。

南部片礁也不适合丹潜水了，虽然那里的水质会好一些，但是也好不到哪里去。毕竟，整片海域是一个相互联系的生态系统。

德·玛丽尔还曾经在这里为水族市场捉过热带鱼，但是他现在放弃了，因为海水越来越浑浊，他都无法看清水里的东西了。

德·玛丽尔说道：“多年前，我们潜水时只需要应付海风(它会使海水变得浑浊)，而现在，除了海风，我们还要提防藻类暴发。”

关于出现这些问题的原因，答案因人而异。而这些回答可能会像科学历史课程



那样复杂，也可能会像一道基础数学题那样简单：往一个需要洁净的无污染水的环境里注入下水道污水和农业管道里的营养盐，然后你就得收拾像佛罗里达湾和佛罗里达礁岛群南部片礁这样的乱摊子。南部片礁的珊瑚覆盖率已经下降到了7%。

凯斯国家海洋保护区和佛罗里达国际大学的科学家们都有个疑问：尽管从内陆排放出来的废物中含有营养盐，但问题是这些营养盐在流经东部和中部海湾边缘的红树林时发生了什么变化？

而且，在藻类暴发时间和海草死亡时间的先后顺序上，仍然存在争论。

保护区的科学顾问，佛罗里达湾计划管理委员会的成员之一布莱恩·凯勒说，管理人员确实检查过流入海湾的水的水质。但他们不同意那些关于流入海湾的水可能造成危害的说法。

皮尔斯堡美国海洋研究所港口分所的资深科学家布莱恩·拉普安特指出，从高营养盐理论盛行导致向海湾注入更多的水那刻起，海湾已经惨遭影响。

拉普安特是高营养盐理论的主要反对者之一，他说这种理论没有解释问题的关键所在。因为早在20世纪70年代就有更多的新鲜水源（淡水）流入海湾。这被称作是临时行动计划，在该计划实施期间，甘蔗地里的水被抽回到欧基求碧湖，保持土壤干燥，最后这些水向南被导入了佛罗里达湾。

实施临时计划的目的是为了防止欧基求碧湖在回抽水时所含有的大量营养盐导致藻类暴发。

对欧基求碧湖来说，这个方法很奏效。然而，对于海湾来说，就不会那么灵了。

自从20世纪80年代早期，拉普安特就开始寻找导致黑水现象的原因。也是在那时，他开始了一个监测佛罗里达礁岛群中部以南的Looe礁岛的计划，该计划一直持续到现在。

他说，藻类暴发在先，然后成片的藻类导致10万多亩的海龟草窒息死亡。

然后这些藻类就随着鲨鱼河沼泽流出的富氮水一起流入了西佛罗里达湾。

在他最近发表在《实验海洋生物学与生态学》杂志上的一篇论文中，拉普安特说他利用氮的同位素来追踪Looe礁岛上营养盐的来源。

他发现当降雨量过大时，试验显示营养盐来自于下水道的污水。

而当内陆向海湾注入的水位较高，并且该水是通过流经岛屿之间的水道到达Looe礁岛时，试验显示营养盐则来自于农业排水。

尽管礁岛群藻类最密集的地方正在建立更完善的检测系统，但工作却并没有结束。许多家庭仍在使用化粪池，而将大量营养盐注入礁岛群水域中的正是化粪池。

基韦斯特市有下水道，那里的人们在将废水抽入注水井前会将废水进行处理，以除去水中所含的营养盐。斯多克岛正在修建下水道，而且一旦基韦斯特下水道日污水处理量达到10万加仑，斯多克岛则会采取与基维斯下水道一样先进的处理方法。马拉松市只有900个家庭与下水管道网络相连，而且整个网络是以小威尼斯的模式进行操作的。伊斯拉莫拉达和大礁岛也正实施水处理计划，下水道系统正在建设中。

然而，我们还要考虑从内陆注入的废物。

水流输送修订计划将于2006年完成。届时，大量工程设备的改进会使流经埃弗格莱兹注入佛罗里达湾的薄层水流量每秒

增加4,000立方英尺。

拉普安特曾经说过，逐渐增加的水量和处理过的水流可能对沼泽地和水质都大有裨益，否则，水质不合格的水会危害海湾和礁石。

水务管理者指出，注入的水越多就意味着注入的氮越多。

尽管美国国家科学院在2002年8月要求就拉普安特的"氮疑问"进行进一步调查，但当地水务管理者还是不愿意承认问题所在。

迪凡·希诺和她的丈夫克莱格一起创建了珊瑚保育组织——礁石救助组织，她说还有一线希望。礁石救助组织是一个旨在保护濒临死亡珊瑚的民间组织。它一直和拉普安特一起，为了让公众认识到水污染问题而并肩作战，并在6月初有成效，事情正在朝他们希望的方向发展。

南佛罗里达州水资源管理局副执行理事奇普·梅里厄姆在一封信中写道：管理局正在探讨氮可能对海湾和珊瑚礁产生的影响。

核心词汇

peninsula [pi'ninsjulə] *n.* 半岛
lush [lʌʃ] *adj.* 苍翠繁茂的，多青草的
turtle ['tə:tl] *n.* 海龟
reef [ri:f] *n.* 暗礁，礁
coral ['kɔrəl] *n.* 珊瑚，珊瑚色
smothering ['smʌðəri] *adj.* 令人窒息的
wander ['wɔndə] *vi.* 游荡，徘徊
aquarium [ə'kwεəriəm] *n.* 水族馆，养鱼池
murky ['mə:ki] *n.* 黑暗的，朦胧的
runoff ['rʌnɔ:f] *n.* 流走之物，径流量
mangrove ['mæŋgrəuv] *n.* 红树林
fringe [frindʒ] *vt.* 加饰边于，水流过
sanctuary ['sæŋktjuəri] *n.* 保护区，圣所
hypersalinity [.haipə.sə'liniti] *n.* 高矿化度
interim ['intərim] *adj.* 暂时的，临时的
infusion [in'fju:ʒən] *n.* 灌输，注入
isotope ['aisəutəup] *n.* 同位素
sewer ['sjuə] *n.* 下水道，阴沟
septic ['septik] *adj.* 腐败的，腐烂的
injection [in'dʒekʃən] *n.* 注入
flush [flʌʃ] *v.* 淹没，奔涌
glade [gleid] *n.* 林间湿地，沼泽地
deputy ['depjuti] *adj.* 代理的，副的

Finding a Future for an Endangered Bird

3. 为濒临灭绝的红顶啄木鸟寻找未来

机经选粹

这一篇讲有些动物仍然很危险。主要是拿红顶啄木鸟作例子，全文就主要讲述这种动物面临的情况，以及保护它的办法和措施。

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Finding a Future for an Endangered Bird

An innovative program is putting private landowners on the side of the red-cockaded woodpecker.

The operation at Eglin Air Force Base in the Florida Panhandle is reminiscent of the opening scene from the late 1970s Vietnam War movie Apocalypse Now. A helicopter comes out of the distant blue horizon, flying low over a verdant expanse of forest. The "wop-wop-wop" of the engine pulses in the air. The chopper fires spherical objects, like ping-pong balls, at the ground, and flames burst against the trees. "It's like starting a zillion lightning-strike fires all over the place," says Carl Petrick, the man who has called this air strike. "You can burn well over a 1,000 acres an hour."

Petrick plans these flights of flame not to destroy the forest but to restore it. He is a civilian biologist in charge of Eglin's wildlife management, and he knows that fire will make the area more suitable habitat for red-cockaded woodpeckers, an endangered species and the center of often-controversial management programs.

The birds live in southern pine forests and require woods relatively clear of undergrowth. In earlier times, fires started by lightning burned much of the southern pine forest every few years, incinerating the understory and the hardwood saplings that would otherwise have crowded out pines. Fire-resistant longleaf pines were scorched

at their bases, but otherwise unharmed.

This system worked fine until twentieth-century fire-fighting policies cooled off the woods, allowing hardwoods to grow up and replace vast areas of pine forest. "It's been the Smokey Bear complex," says Ralph Costa, red-cockaded woodpecker recovery coordinator for the U.S. Fish and Wildlife Service (FWS). "Taking recurring natural fire out of the system has completely changed the table scraps of longleaf ecosystem we have left, in that they have serious hardwoodmidstory problems." The main red-cockaded problem is that the birds abandon forests choked with non-pine growth.

Learning the importance of fire to the survival of the endangered bird has been long in coming. Indeed, the means to red-cockaded survival are only now becoming clear. But the leaps in scientific understanding have initiated some remarkable successes in managing the woodpeckers. They also have provided conservationists with data needed to add supplement to the *Endangered Species Act* and to assure private landowners that doing right by the endangered woodpeckers will not impinge on economic interests. As a result, experts say, a bird whose future until recently looked grim could be poised for a comeback.

Named for a tiny red streak on the side of the male bird's head, the cardinal-sized, black-and-white red-cockaded woodpecker probably evolved in southern old-growth longleaf pine forests. But the entire piney universe to which red-cockaded woodpeckers are finely calibrated—a belt of tall, widely spaced evergreens that covered 90 million acres of coastal plain from Chesapeake Bay to East Texas—has for the most part vanished. The cause is not just fire control but also heavy logging around the turn of the century. As the old-growth forest fell, so did red-cockaded woodpeckers, declining from an estimated 1.6 million family groups at the time Columbus sailed to about 4,500 groups (or roughly 12,000 individual birds) now. FWS listed the red-cockaded woodpecker as endangered in 1970.

The South still has millions of pines, but few pinelands suitable for red-cockadeds. Pines planted to produce pulpwood and paper have replaced primeval longleaf, and in these commercial forests, trees are cut decades before they can become useful to the woodpeckers. The birds prefer pecking cavities into the living pines of only two species, and the trees must be at least 80 years old, an age at which they become internally weakened by a fungus called red heart. On average, the birds spend six years making a cavity in a longleaf pine, two years in a loblolly.

Red-cockadeds live in family groups made up of parents, some adult male offspring, and, during breeding season, the newly fledged young of both sexes. Young males from former years help feed nestlings, defend territory and do other woodpecker work, such as cavity excavation. Young female red-cockadeds usually leave their parents' territory, sometimes joining other groups that have lost a breeding female.

According to Jeffrey Walters, a red-cockaded woodpecker researcher at Virginia Polytechnic Institute and State University, sticking close to home gives a young male a better chance of becoming a breeder himself.

Each woodpecker family occupies several cavity trees within the group's territory, and a successful helper can inherit these cavity trees when his father dies. Or he may be able to take over another cluster when a neighboring, unrelated breeding male dies.

Because of the clear importance of old pines to red-cockaded survival, early efforts to rescue the birds focused almost entirely on setting aside large stands of pines, called recruitment stands. But red-cockadeds seemed disinclined to pioneer these stands, and the species declined steadily throughout the South during the 1960s, '70s and '80s. "The birds' reluctance didn't make sense to anyone at the time." says Walters. But research soon revealed the source of the recalcitrance. In 1988, scientists drilled artificial nest cavities in trees that grew within 20 test patches of forest unoccupied by woodpeckers. By the next breeding season, red-cockadeds had moved into 18 of the test areas. In contrast, no birds moved into the control plots, which lacked artificial cavities. "The key is really the cavities," says Walters.

Suddenly, conservationists had a potent tool for helping the species, and this tool soon was put to use when, in September 1989, Hurricane Hugo's 115-mph winds flattened vast tracts of the Francis Marion National Forest in South Carolina. The forest was home to the nation's second-largest red-cockaded woodpecker population. "We lost 87 percent of the active cavity trees and 63 percent of the red-cockaded woodpeckers," says Craig Watson, a biologist at Francis Marion. After the storm, biologists found almost 700 of the area's 1,900 woodpeckers still alive, but only 200 undamaged cavity trees remained. Watson had a housing crisis on his hands.

Within a month, Forest Service crews were drilling cavities for the refugee birds. As of 1995, 1,400 of the cavities dotted the forest, and Francis Marion's 371 red-cockaded groups still ranked among the species' largest populations (Apalachicola National Forest in Florida has the largest, with 650 groups). "It's one of the big success stories for endangered species," says Watson.

Presently, red-cockaded woodpeckers are increasing in a number of southern pine forests, and artificial cavities have played a part in each case. But where there is a way to save woodpeckers, there is not always a will. Attacks on the *Endangered Species Act* in Congress, and specifically on protection for red-cockadeds, and lack of commitment to the bird's protection among land-management agencies may throw cold water on woodpecker recovery. "The biggest threat to this species today is more in a political nature than it is a biological nature," says North Carolina biologist J.H. Carter, III, whose research has revealed much of what is known about red-cockaded habitat needs. (He published his first report on the species 30 years ago, when he was 15.)

For example, federal lands play a crucial role in meeting the FWS plan to establish 300 to 500 groups of the birds at each of 15 sites across the Southeast. National forests will make up the bulk of territory for 13 of the recovery populations. Already, more than half of all red-cockaded woodpeckers are found in national forests, though only Apalachicola has more than 500 groups.

Despite the forests' importance, Forest Service guidelines for managing woodpecker habitat,

released in June 1995, do not go far enough in protecting the woodpeckers, according to a consortium of conservation groups. Woodpecker researcher Fran James, of Florida State University, gives the new national-forest guidelines mixed marks. "They're a great improvement over previous plans." she says, because woodpecker habitat will be managed in units of several family groups, and trees will be cut on longer rotations. But in a concession to timber interests, the service plans to allow more logging in red-cockaded woodpecker habitat than experts recommended. Another fault in the guidelines, says James, is that local forest managers are not required to pursue "a very vigorous prescribed burning regime."

The assault on woodpecker management also has been conducted in Congress. Early last year, Senator Jesse Helms (R-North Carolina) attempted to halt protection of redcockadeds at the Army's Fort Bragg in North Carolina. He dropped his effort when even the Pentagon opposed his goal. Later in 1995, 15 of Helms colleagues petitioned the Interior Department to remove the woodpecker and two other troublesome birds from the endangered-species list. The congressional petition, which is still pending, argued that the Endangered Species Act's "perverse incentives" discourage conservation by imposing ruinous financial burdens on private landowners who have protected wildlife on their property.

A new federal program suggests the weakness of that argument. This is Safe Harbor, a program that FWS launched last year to encourage voluntary improvements to privately owned red-cockaded woodpecker habitat in a six-county area of the North Carolina sandhills.

For example, Billy Clark, an attorney in Fayetteville, North Carolina, wants to manage his 2,000 acres to yield pine needles for the garden-mulch market. Under a 99-year Safe Harbor permit, Clark has agreed to maintain enough pine habitat, as determined by FWS biologists, to support the four groups of woodpeckers nesting on his land. These groups serve as his baseline birds. If more. woodpeckers move onto his land, Clark will not be responsible for protecting the newcomers under the Endangered Species Act, beyond giving biologists time to relocate any affected woodpeckers before he cuts pines.

"Although the Safe Harbor concept may not work for all species," says John Kostyack, the National Wildlife Federation's attorney for endangered-species issues, "it offers promise for the red-cockaded woodpecker. Under the program, the FWS protects current population levels on private lands and encourages private landowners to voluntarily increase those populations by eliminating any fear that ESA restrictions might result when new habitat is created."

Safe Harbor, says Carter, has helped to ameliorate property owners' fears of government control. "It's given us more tools to deal with private landowners," he says, "and has given them more reasons not to be scared to death of the Fish and Wildlife Service and the Endangered Species Act." To date, 12 landowners responsible for 15,000 acres of private pineland have signed up with Safe Harbor.

Safe Harbor plans are being set up to help red-cockaded woodpeckers (and other endangered species) beyond the Carolina sandhills. "Landowners just love it," claimed Ralph Costa, the FWS woodpecker recovery coordinator, after meeting last fall with

Louisiana pineland owners interested in joining a statewide Safe Harbor plan. They say, "this is all we needed. Just take away the onus of the government telling us what we can and cannot do with our land, and we'll give you habitat, we'll give you birds."

If Costa is right, someday this southern bird may at last be out of the woods, and at home in its pines.

参考译文

红顶啄木鸟生活在南部松树林和林下植物相对较少的森林中。早些时候，每隔几年，闪电总会引发大火，烧掉大部分南部松树林，把与松树争夺生存空间的林下植被和落叶树的树苗烧成灰烬。而耐火的长叶松虽然根部被火烧焦了，却并没有受到什么实质性伤害。

这种生态系统一直运作得很好，直到20世纪防火政策出台，给森林降温使落叶木生长并逐渐取代了大片的松树林。美国渔业及野生动物局红顶啄木鸟恢复协调人拉尔夫·寇斯塔说："斯摩基熊(美国森林防火的象征)情结将循环发生的自然火灾清除出了这个生态系统，从而完全改变了我们之前维持的长叶松生态系统的局面，长叶松林已经有了严重的落叶木中层植被问题。"红顶啄木鸟的保护所面临的主要问题是，这种鸟会离开没有松树生长的森林。

长久以来，人们都在试图了解火灾对这种濒临灭绝的鸟类的重要性，事实上，使红顶啄木鸟继续生存的方法直到现在才逐渐明朗起来。然而，对于这个问题在科学理解上的飞跃已经指导了多项卓越而成功的对红顶啄木鸟的管理。同样，它们也为自然资源保护者们提供了所需的数据，使他们能为《濒危物种法》增加些相关条款。而且，他们可以使用这些数据让私人土地所有者们相信，保护红顶啄木鸟不会损害到他们的经济利益。因此，专家们说，虽然目前这种鸟儿的前景依然令人担忧，但是恢复它们的生活还是有可能的。

红顶啄木鸟因雄鸟头顶上有微小的红色条纹而得名，它身体的大小与美洲红雀相当，身上有黑白相间的羽毛。它很可能是在南部成熟的长叶松林里逐渐进化而来的。然而，红顶啄木鸟高度适应的整个松林世界已经消失了一大半。从切萨皮克湾到东得克萨斯州9,000万英亩沿海平原的一片参天的树间很宽的常绿森林覆盖了这片松林世界。这不仅仅是由于火灾控制，也是因为本世纪初的大量砍伐。随着成熟生态林的减少，红顶啄木鸟的数量从哥伦布航行时期的大约160万个家族减少到现在约4,500个家族(或者说大约1.2万只)。美国渔业及野生动物局在1970年将红顶啄木鸟列入濒危物种名单。

在南部，仍然有数百万亩的松树，可是很少有适合红顶啄木鸟生存的松林了。用于生产纸浆用木材和纸的松树已经替代了原始长叶松。而且这些经济林中的树木很早就被砍伐了。而那时这些树木还要过几十年才能被红顶啄木鸟所利用。这种鸟类只喜欢在现存的2种松树上啄洞，而且这些松树至少要有80年的树龄。到了这个树龄的松树已经被一种叫做"红心"的真菌给侵蚀了，内部变得很脆弱。平均来讲，红顶啄木鸟在长叶松上筑一个洞要花6年的时间，在火炬松木上则需要2年。

红顶啄木鸟以家族形式生活在一起，一个家族包括鸟爸爸、鸟妈妈和一些成年的雄性后代。在繁殖季节里，家族里还会有新生的雄鸟和雌鸟。早些年出生的年轻雄鸟会帮助父母喂养雏鸟、保护领土和做些其他啄木鸟做的工作，比如说啄洞。而年轻的雌性红顶啄木鸟则要离开父母的领土，有时还会加入到那些失去了可以繁殖的雌鸟的家族中。

因为古老的松树对红顶啄木鸟的生存有着显而易见的重要性，早期对这种鸟类的拯救几乎完全是靠种植大棵的松树。这种行动被称为“补充树木”。但是红顶啄木鸟似乎不愿意定居在这些树上，以至于20世纪60年代到80年代期间，整个南部地区该物种的数量持续减少。华特斯说：“当时谁都不了解鸟儿们为什么不情愿住在这些松树上？”但是，相关研究很快揭示了造成这个现象的原因。1988年，科学家们在红顶啄木鸟不愿居住的20片实验林中的树木上钻了一些洞。在下一个繁殖季节里，红顶啄木鸟们就搬进了其中的18片实验林中。而与此形成对比的是，没有鸟搬入树上没有人工钻洞的树林里。华特斯指出：“其实关键就是那些洞。”

这样，突然之间，生态环境保护者们有了一个能够帮助这个物种生存的有效工具，而且这个工具很快在1989年9月被投入使用。那时候飓风“雨果”以115英里每小时的风速席卷了南卡罗莱纳州法兰西斯·马瑞恩国家森林的大片领域。这个森林是全国第二大红顶啄木鸟聚居地。法兰西斯·马瑞恩的一名生物学家克雷格·沃森说：“在这场飓风里，我们失去了87%的啄木鸟赖以生存的树木和63%的红顶啄木鸟。”风暴过后，生物学家发现这个地区原来生活的1,900只啄木鸟幸存了700只，但只有200棵有洞松树未受损害，最后活了下来。沃森需要解决好这些鸟的“住房危机”问题。

目前，在南部的一些松树林中，红顶啄木鸟的数量正在逐步增加，其中人造洞穴起了很大作用。然而，虽然有了保护红顶啄木鸟的方法，但政府却并不总是有保护鸟类的意愿。国会对《濒危物种法》的攻击，特别是对红顶啄木鸟保护条款的反对，以及土地管理机构不大支持对这种鸟类的保护都可能给啄木鸟的生存恢复泼冷水。“现在对于这个物种来说，最大的威胁是来自政治环境而不是生物自然。”北卡罗来纳州生物学家J·H·卡特三世说道。他的研究揭示了许多红顶啄木鸟栖息地所必需的条件。(早在30年前，他15岁的时候，就发表了第一篇关于这个物种的论文)。

核心词汇

understory ['ʌndəˌstɔːr] *n.* 林下叶层
sapling ['sæpliŋ] *n.* 树苗，小树
scrap [skræp] *n.* 残余物，些微
choke [tʃəuk] *vt.* 窒息，抑制
woodpecker ['wudpekə] *n.* 啄木鸟
supplement ['sʌpləmənt] *adj.* 补充，补充物
impinge [im'pindʒ] *v.* 冲击，损害，侵犯
streak [striːk] *n.* 条理，斑纹
evergreen ['evəgriːn] *n.* 常绿树，常绿植物
pulpwood [pʌlpwud] *n.* 纸浆用木材
primeval [prai'miːvəl] *adj.* 原始的，早期的，远古的
fungus ['fʌŋgəs] *n.* 真菌，霉菌
loblolly ['lɔblɔli] *n.* 火炬松
recruitment [ri'kruːtmənt] *n.* 补充，征募新兵
disinclined [disin'klaind] *adj.* 不愿的，不想的
reluctance [ri'lʌktəns] *n.* 不愿，勉强
recalcitrance [ri'kælsitrəns] *n.* 固执，顽抗
conservationist [ˌkɔnsə'veiʃənist] *n.* 生态环境保护者

Oil Spill
4. 小议溢油

机经选粹

这一篇是关于处理海上石油泄漏问题的。海上石油泄漏会对环境、社会经济造成影响。文中还介绍了有关海洋环境治理和发生泄漏之后的措施等。

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Oil Spill

What's an oil spill?

Oil spills happen when people make mistakes or are careless and cause an oil tanker to leak oil into the ocean. There are a few more ways an oil spill can occur. Equipment breaking down may cause an oil spill. If the equipment breaks down, the tanker may get stuck on shallow land. When they start to drive the tanker again, they can put a hole in the tanker causing it to leak oil.

When countries are at war, one country may decide to dump gallons of oil into the other country's oceans.

Terrorists may cause an oil spill because they will dump oil into a country's ocean. Many terrorists will do this because they are trying to get the country's attention, or they are trying to make a point to a country.

Illegal dumpers are people that will dump crude oil into the oceans because they do not want to spend money on decomposing their waste oil. Because they won't spend money on breaking up the oil (decomposing it) they will dump oil into the oceans, which is illegal.

Natural disasters (like hurricanes) may cause an oil spill, too. If a hurricane was a couple of miles away, the winds from the hurricane could cause the oil tanker to flip over, pouring oil out.



What affects do oil spills have on animals?

Birds die from oil spills if their feathers are covered in oil. The bird will then be poisoned because it will try to clean itself. Animals may die because they get hypothermia, causing their body temperature to be really low. They may die from really low body temperature. Oil may also cause the death of an animal by entering the animal's lungs or liver. The animal will then be poisoned by the oil. Oil also can kill an animal by blinding it. The animal will not be able to see and be aware of their predators. If they are not aware of other animals, they may be eaten.

There has recently been an oil spill on May 9, 2001 in the Galapagos Islands. The Galapagos Islands are located off the coast of Ecuador. The tanker, Jessica, tipped over pouring 240,000 gallons of oil into the ocean.

Workers used chemicals to break down the oil. If the oil is able to reach the bottom of the ocean, it might take at least two years to clean. Sea lions, pelican, seagulls, sea urchins, and seaweed have been affected by this spill. Workers used soap to clean the fur and feathers of hurt animals and milk for the animals' heads because it wouldn't hurt the animals' eyes.

A couple months after the Jessica oil spill, scientists are studying different things about the spill. Some scientists are studying 650 different sites and seeing which sites were affected by the spill. They are trying to find out where the oil impacted and the animals that were and weren't affected so they can learn more about the effects of oil spills.

How do they clean up the oil on the beaches or the water after a spill?

There are many ways to stop the spread of oil in the ocean. Workers can place a boom around the tanker that is spilling oil. Booms collect the oil off the water. A boom may be placed somewhere before an oil spill. They can be placed around an entrance to the ocean, like a stream. They also can be placed around a habitat with many animals living there. These booms will absorb any oil that flows around it.

The workers can also use skimmers. Skimmers are boats that can remove the oil off the water. Sorbents are sponges that can collect the oil. An airplane can fly over the water dropping chemicals into the ocean. The chemicals can break down the oil into the ocean.

They also can burn freshly spilled oil with fireproof booms to contain the oil. They might not decide to burn the oil because this method causes air pollution.

There are just a few ways to clean the oil off the beaches. Workers can use high or low pressure hoses to spray the oil that is on the beaches. Vacuum trucks may be driven on the beaches to vacuum up the oil. They can also simply use shovels or road



equipment to collect all the oil off the beaches.

The method they use to clean the beaches or oceans depends on many things. They have to look at the weather, the type and amount of oil spilled, if people live in that area, what types of animals live in that area, and many more things. In some situations, they may not react to a spill. It may not be helpful or it would just cause even more damage to that habitat.

How do they clean animals after a spill?

Birds

There are many ways that animals are cleaned after an oil spill. When birds arrive at the cleaning center, the oil is flushed from the eyes and the intestines. They will also be examined for any broken bones, cuts, or any other injuries. Next, they will get a stomach-coating medicine to prevent any more oil from entering birds' stomachs. Birds will then be warmed and placed in a quiet area.

Birds need to eat so they have some nutrition while they are recovering. Some animals might eat off a pan. Others may be forced to eat by a worker before they can feed themselves.

When a bird appears to be normal, it is allowed to swim. The bird will then trim and clean its own feathers to bring them back to their normal body structure. This will help the bird swim again. Next, the bird will have to pass a waterproof test. If the bird passes, it will slowly be introduced to the temperatures outside. In the test, the bird must show the ability to float and the ability to keep the water away from its body. Before they let the bird go, they must check it to make sure that its muscular structure is average for its species and the birds have no disease. Then the birds are released into the wild.

Sea Otters

When sea otters are taken to a cleaning facility, the heavy oiled otters will be washed first. Workers will wash the otters with warm water because they hope it will break down the oil. The warm water also can warm the otters up. The otters also will get medical treatment while they are being cleaned. The otters will then have to wait so they can dry.

After their fur is dry, they have to stay a few more days so the workers are sure of no diseases or broken bones.

Helping and Saving the Sea Life Today

Have you ever stopped to think what you use oil for? Every one uses oil a lot. The whole world uses nearly three billion gallons of oil every day. We all use it to fuel our

cars, trucks, buses, and even to heat our homes. If you have touched a chain on a bicycle, you have touched some oil. The black stuff that appears on your fingers is an oil that makes the chains on your bike run smoothly. We use oil to make asphalt which can help us pave our roads. You can get examples of oil at a toy store, a hardware store, or a drugstore, because oil is made into plastics, which could be any of your toys or CD players. Oil is also used in medicines, ink, paints, and to create some electricity. We all can help stop oil spills happening in the oceans. If you use less oil, then less will have to be transported. We can use less oil by not using our cars when we can walk or ride a bike. We also can use less oil by paving the roads with cement. That way we are not using oil.

Think about how many lights you have in your house. Also think about all the electronics like computers or televisions. All of these things use electricity. If we all were to turn off lights, computers, or televisions when not in use, we wouldn't be using as mush oil to create the electricity throughout the house.



参考译文

海上溢油是由人为失误或大意，致使油轮将石油泄漏入海造成的。造成溢油的原因还有很多，如设备故障也可能造成溢油。一旦设备发生故障，油轮极易搁浅，当重新启动时，油轮与水底摩擦产生的洞口会导致石油泄漏。

自然灾害(如飓风)也可能造成海上溢油。远在几十米开外，飓风的风力就能将油轮倾覆，致使石油倾泻入海。

有多种阻止石油在海上扩散的方法。工作人员可以给正在泄露的油轮围上栏木，以起到聚集原油的效果。事先可以在一些地方准备好栏木。栏木可以置于入海口处，比如说溪流的入海口。还可以放置于聚集着多种动物的栖息地周围。这些栏木会吸收任何漂浮在其周围的石油。

工作人员还可以使用撇油器。撇油器是一种从海面撇取浮油的船型设备。该设备使用的吸油材料是能吸附油脂的海绵。同时可以使用直升飞机向海面抛洒能够分解原油、净化水质的化学药剂。

他们还可以用防火栏木汇集新泄漏的浮油，然后将其焚烧。可是因为担心造成大气污染，他们可能不会采取这种方法。

去除海滩上的溢油只有几种方式。工作人员可使用高压或是低压水枪将沙滩上原油溅散；或利用真空油槽车在海滩上吸取原油；更简单易行的方法就是用电铲和道路清除设施将沙滩上的原油清除。

清洁沙滩或是海水要采取何种方法是由很多的因素决定的。工作人员需要查看天气，

了解溢油种类和数量，调查是否有人类在附近居住以及有什么动物栖息，等等。在某些情况下，发生溢油之后他们不会采取任何行动。因为此时他们的行动可能不会有什么帮助，甚至会对那片栖息地造成更多的损害。

溢油发生之后，有很多种清洁动物的方式。如冲洗送至清洁中心的鸟类，去除其眼睛和肠道中的油，同时对其做全面检查确保它没有骨折、割伤或是受到任何其他的伤害。下一步，喂服糖衣胃药以阻止再有原油进入胃部。最后，温暖它的身体，并将它安置在僻静之处。

在恢复过程中，鸟儿需要适当进食以保证营养。一些鸟儿可以吃掉一平底锅饲料，而其他一些在它们自己可以取食之前则需要工作人员强制喂食。

一旦恢复正常，鸟儿们就可以去游泳了。此时，它们会梳理清洁羽毛，使自己回复到之前的健康体态，这也帮助它们重新游弋在水面。接着，它们需要通过一项防水测试。一旦过关，慢慢地，工作人员会将其放归自然，让它逐渐适应外部的温度。在测试中，它们必须显示出可以浮在水面和使身体不致沾水的能力。在回归自然之前，工作人员们须对它们进行检查以确保它们的肌肉结构达到同类的一般水平，且没有疾患。然后，这些鸟才被放归自然。

你是否曾停下来思索过人类为何用石油？我们每个人都消耗了许多石油。每天全世界的耗油量几乎达30亿加仑。我们用它给汽车、卡车、巴士加油，甚至用它给家庭供暖；摸一下自行车的链条，你会摸到一些油，你手上这黑乎乎的玩意儿就是让自行车链条顺畅运转的油；我们用从石油中提取沥青来铺路；我们还可以在玩具店、五金器品店，或是药店里找到它的踪迹，因为石油可以制造塑料；它还会存在于任何玩具或是CD播放器中；石油还可以用于制造药品、墨水、油漆制品，也可以用来发电。我们大家都可以为杜绝海上溢油做出自己的努力。耗油愈少，油料运输就会愈少。我们可以用步行或是骑自行车来取代开车以减少耗油。还可以用水泥而不用沥青铺路，这样我们就没有使用到石油，从而减少了石油的总使用量。

想想你家中有多少盏灯？再想想所有的电器如电脑、电视机等。所有这些都用电。如果及时关掉没有在使用的灯泡、电脑、电视机，我们就将不再需要那么多的石油来发电供整个家庭使用了。

核心词汇

tanker ['tæŋkə] *n.* 油轮
leak [li:k] *vt.* 漏，泄漏
shallow ['ʃæləu] *adj.* 浅的
disaster [di'zɑ:stə] *n.* 灾害，灾难
hurricane ['hʌrikən] *n.* 飓风
skimmer ['skimə] *n.* 撇油器
sponge [spʌndʒ] *n.* 海绵
fireproof ['faiəpru:f] *adj.* 耐火的，防火的
shovel ['ʃʌvl] *n.* 铲，铁铲
stomach ['stʌmək] *n.* 胃，胃部
nutrition [nju:'triʃən] *n.* 营养
waterproof ['wɔ:təpru:f] *adj.* 防水的，不透水的
gallon ['gælən] *n.* 加仑
asphalt ['æsfælt] *n.* 沥青，柏油

Organic: Is It the Future of Farming?

5. 有机农业：这是农业的未来发展方向吗？

机经选粹

这一篇是关于农业的，讨论了传统农业和有机农业的区别。

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Organic: Is It the Future of Farming?

If your politics are green, you like your medicine 'holistic' and you're deeply worried by economic globalization, the chances are your fridge is full of organic produce. Today, support for organic farming is frequently part of a bigger social and political mindset—one that holds that 'natural' is best, and that naked capitalism is a threat to the health of the planet and its people.

But the origins of organic agriculture, in 1940s Britain, are more down-to-earth. Its pioneers were concerned, above all else, about the soil beneath their feet. Their philosophy was centred on practices designed to improve the richness and stability of the soil by restoring its organic matter and avoiding synthetic fertilizers, pesticides and herbicides. Wider concerns about biodiversity, social justice and animal welfare have grown from this core concept about how to manage our farmland's key resource.

These ideals have always set the organic movement squarely against intensive farming and chemical-based agribusiness. And, at least in public and in the media, those arguments rage more fiercely today than ever before. Yet behind the harsh



rhetoric, a little-noticed convergence of views is taking place. For decades, the study of organic farming sat on the fringes of the green revolution in agriculture, as intensive techniques marched across the world, sending yields skyrocketing. But mainstream agronomists are becoming concerned about the long-term sustainability of this approach, and are focusing increasingly on soil integrity. Could it be that both sides of agriculture's great divide now want the same thing?

"It's been a huge move," says Mark Alley, an agronomist at Virginia Tech in Blacksburg. "Twenty-five years ago, yield was everything. But in the past ten years, there's been a major recognition of the need to maintain organic materials in soil." And with the turn of the millennium, farmers have started to embrace approaches that keep soil structure intact and cut the high level of inputs—energy, fertilizer, pesticides and herbicides—that characterize intensive agriculture.

Going Green Again

These new methods diverge significantly from the purist organic vision. In particular, they rely heavily on 'low tillage' methods, which help to improve the soil but depend partly on the use of herbicides, fertilizers and pesticides. Those remain anathema to the organic movement. But the change that is taking place—sometimes referred to as the second green, or doubly green, revolution—stems from a growing acceptance of the organic critique of the first one. Mainstream agronomists now acknowledge, for example, that intensive farming reduces biodiversity, encourages irreversible soil erosion and generates run-off that is awash with harmful chemicals—including nitrates from fertilizers that can devastate aquatic ecosystems.

For the organic movement, caring for the soil involves interspersing each harvest with a cover crop such as clover or rye that can fix nitrogen from the atmosphere. Cover crops keep down weeds, retain moisture and prevent erosion. Ploughing them into the soil at the end of the season restores the soil's organic content, and boosts its nitrogen content without the need to use synthetic fertilizer.

The low-till approach borrows heavily from these principles. Low-till farmers ensure that their soil is not left open to erosion by growing nitrogen fixers between rows of their cash crops and between seasons. But low-till farmers don't completely unhitch their wagon from conventional inputs. They still use nitrate fertilizers and pesticides as needed. Before each planting, they kill the previous crop with a broad-spectrum herbicide such as Roundup, made by Monsanto of St Louis, Missouri. This lets them punch the new seed directly into the ground through the decaying plants without tilling.

Till Life

Low-till agriculture is taking root in both rich and poor countries. Pat Wall, head

of conservation agriculture at CIMMYT, the International Maize and Wheat Improvement Center in Mexico, estimates that about 70 million hectares of arable land—something like 2% of the global total—is now using the method, with about a third of that in the United States.

Brazil has been in the vanguard of the change in the south, says Cheryl Palm, an ecologist specializing in tropical agriculture at Columbia University in New York. "It's swept through the country, and cut down soil erosion dramatically," she says.

Although many of the farms that are converting to low-till agriculture are large-scale operations, the approach is also rapidly gaining acceptance on smallholdings in places such as Ghana and India. On the Indian subcontinent, the area where low-till is being implemented has grown from nothing in 1997, through 100,000 hectares in 2001, to one million hectares this year.

Besides conserving soil structure, low tillage also reduces energy inputs. Farms in India that grow rice in the summer and wheat in the winter have cut their number of annual tilling operations from eight to one, Wall reports, reducing fuel use by 70%. "When I was there, the only people complaining about the change were the petrol station owners," he says.

Low-till farming also substantially reduces the need for chemical fertilizers. Cover crops provide some nitrogen initially, and then, as organic matter builds up in the soil, nitrates and other nutrients are less readily leached out of it, further decreasing the requirement for added fertilizer.

But for organic purists, any approach to maintaining soil integrity that incorporates regular sprayings with Roundup and continued applications of nitrates is heresy. Peter Melchett, policy director of Britain's Soil Association, the world's oldest organic farming organization, scorns low-till approaches. "They tend to be something you can do for two or three years until you get grass weeds that aren't well-controlled by Roundup," he says. "Then you have to resort to ploughing."

Wall disagrees. He argues that the need for herbicide applications tails off after the first few years of low-tillage, as weed seeds disappear from the top layer of soil. "I think it is possible to get to no tillage and almost no herbicides," he says.

Such disputes might be resolved more readily if there was an abundance of data comparing pure organic methods with the low-till approach to soil conservation. "But there aren't a lot of long-term studies," says Mark David, a biogeochemist at the University of Illinois at Urbana-Champaign. "It isn't a simple comparison to make."

Chemical Cuts

Some of the other ideas being borrowed from the organic movement—in particular a reduction in pesticide inputs—are resulting in a closer meeting of minds. For instance, farmers have been forced to discard methyl bromide, the main soil fumigant that has been used to kill soil pests, as it will be phased out by 2005 under the Montreal Protocol to close the ozone hole. This has led farmers to experiment not only with other fumigants but with organic methods of killing insect larvae as well, including flooding fields between plantings and allowing the Sun to bake the soil through clear plastic sheeting.

Farmers are also bowing to consumer pressure. "People don't want pesticides in their food," says Diana Wall, director of the Natural Resource Ecology Laboratory at Colorado State University in Fort Collins. US orchards, for instance, have largely adopted organic methods for controlling the codling moth (Cydia pomonella), the larvae of which bore into ripening fruit and can destroy 80% of an apple crop without control.

In this case, concerns about pesticide residues on apples and pears led to legal restrictions on the use of organophosphates, the most effective class of pesticides, under the 1996 Food Quality Protection Act. Organic control of the codling moth disrupts mating by releasing sterile males and spraying female sex pheromones to confuse the rest.

The doubly green revolution doesn't necessarily embrace the broader aspects of organic ideology, such as social justice and animal welfare. But if the organic movement wants to change the world, it is making a reasonable start.

参考译文

如果你是一个绿色环保主义者，你喜欢全身治疗的药物，并对经济全球化甚为堪忧，那么你的冰箱里极有可能塞满了有机农产品。如今，支持有机农业正越来越成为一个更大的社会和政治倾向。这些人认为自然的就是最好的，同时也认为赤裸裸的资本主义威胁着地球和人类的健康。

但是在20世纪40年代的英国，有机农业起源时期更注重现实。英国有机农业的先行者们首先关注的是他们脚下的土地。他们的哲学观以实践为中心，计划着去恢复土壤中的有机物质含量，避免喷洒人造肥料、杀虫剂和除草剂，从而提高土壤质量和土壤的稳定性。更多有关生物多样性、社会公正和动物福利的问题都是从如何管理我们农场的关键资源这个核心概念延伸出来的。

这些观念通常将有机运动与集约型农业(高度依赖化学制剂应用的传统型农业)和以化学为基础的农业综合企业(包括农业设备、用品的制造、农产品的产销、制造加工等)直接对立起来。至少在公众和媒体面前，人们关于这一点的争论已经达到了前所未有的激烈程度。然而在无情的言语攻击背后，人们的观点正在某些方面趋于一致，但这点并不引人注目。几十年来，当集约型技术风靡全球，使农业产量猛增的时候，有机农业的研究还处于农业绿色革命的边缘。但是主流农学家们渐渐开始担心集约型农业的长期可持续性，并且越来越关注土壤的完整性。现在农业研究中处于对立的双方都期盼同一件事，有没有这种可能呢？

布莱克斯堡维吉尼亚理工大学的农业学家马克·艾利说："这迈出了一大步。25年前，产量就是一切。但是就在过去的10年里，绝大多数人已经意识到保持土壤中有机物的必要性了。"在千禧年之际，农民们已经开始采取措施以保持土壤结构的完整性，并减少能源、化肥、杀虫剂和除草剂的大量使用。而这些都是集约型农业的特征。

这些新方法与纯粹的有机农业理念还是相差甚远。尤其是他们过度依赖"低耕农业"模式，这有助于提高土壤质量但还是在一定程度上要依赖对除草剂、化肥和杀虫剂的使用。而有机运动（者）对此深恶痛绝并首次提出了批判，然后越来越多的人接受了他们的观点，并且正在做出一些相应的改变。这种改变有时指的是第二次绿色革命或者是双重绿色革命。例如，现在主流农业学家们承认集约型农业减少了生物多样性、加剧了不可恢复的水土流失并且还使一些水资源富含有害化学物质，如化肥中的硝酸盐就会破坏水生生态系统。

对于有机运动来说，保护土壤的措施包括在每次收获后实行间作，如种植苜蓿或者是黑麦，因为它们可以将空气中的氮元素固定在土壤中。间作能抑制杂草的生长、保持土壤湿度并能防止水土流失。每个季末在把这些作物犁进土壤里有利于恢复土壤有机物质的含量，而且无需借助合成化肥就可以补充氮元素。

低耕农业的很多措施都借鉴了这些原则。实行低耕农业的农民在几茬作物间或是季节更替时耕种固氮作物以防止水土流失。但是低耕农业的农民并没有完全放弃那些传统的化肥、杀虫剂和除草剂等。有需要的时候，他们仍然使用硝酸盐化肥和杀虫剂。每次种植前，他们喷洒广效除草剂，如美国密苏里州圣路易孟山都公司生产的"农达"，来清除以前种植的农作物。这样他们不用耕除腐烂的农作物，就可以直接将新的种子种到土壤中。

无论是在富裕国家还是贫穷国家，低耕农业都将得到广泛的推行。据墨西哥国际玉米小麦改良中心保护性农业的负责人帕特·沃尔估算，大约有7,000万公顷耕地正在使用这种耕作方法，约占全球总数的2%，美国1/3的耕地都是这样的。

纽约哥伦比亚大学热带农业生态学专家切瑞·帕姆谈道："巴西是南部改变的先驱者。"她还补充道："这已经在整个国家得到了广泛推行，极大地减少了水土流失。"

尽管许多正向低耕农业转变的都是一些大型农场，但是该措施也迅速得到如加纳和印度地区小农场主的一致赞同。印度次大陆正在实行低耕农业，耕种面积从1997年的零公顷到2001年10万公顷，再到今年的100万公顷。

除了保持土壤结构外，低耕式耕作同样也降低了能量投入。据沃尔报道，在印度，

夏季种植水稻冬季种植小麦的农场其年耕作量从8减少到1，燃料量减少了70%。他还谈到："当我在印度时，只有那些经营加油站的人才会抱怨这种变化。"

同样低耕农业也从本质上减少了对化学肥料的需求量。首先，间作提供了一些天然的氮元素；其次，由于土壤中的有机物质增加，氮和其他的营养成分不易从土壤中过滤出来，从而不必继续添加肥料。

但对于纯有机论者来说，像经常喷洒"农达"除草剂和长期使用硝酸盐化肥等保持土壤完整性的措施都是异端邪说。英国土地委员会是世界上历史最悠久的有机农业组织机构，该委员会的政策司长彼得·梅尔切特对低耕农业不屑一顾。他说："低耕农业只能进行两三年，之后你会发现"农达"除草剂无法有效控制田里的野草，而你将不得不采取犁地的方法来消除它们。"

沃尔却持反对意见。他认为头几年实行低耕农业后，可以逐渐减少除草剂的使用量，因为野草的种子将从土壤的表层消失。他说道："我认为免耕和几乎不喷洒除草剂是有可能的。"

如果在土壤保持方面有大量关于纯有机农业和低耕农业之间的数据对比，这些争端也许更容易解决。伊利诺伊大学厄本那——香槟分校的生物地球化学家马克·大卫说："但是没有很多长期研究的资料，无法简单地进行对比。"

双重绿色革命不一定包括广义的有机思想，比如说社会公正和动物福利。但是如果有机运动想要改变世界，双重绿色革命会是一个良好的开端。

核心词汇

holistic [həu'listik] *adj.* 整体的，全盘的
mindset [maind,set] *n.* 意向，倾向
capitalism ['kæpitəlizəm] *n.* 资本主义
down-to-earth [daun-tu-ə:θ] *adj.* 实际的
synthetic [sin'θetic] *adj.* 合成的，人造的
agribusiness ['ægri,biznis] *n.* 农业综合企业
rhetoric ['retərik] *adj.* 修辞，言辞
sustainability [sə'steinəbiliti] *n.* 可持续性
integrity [in'tegriti] *n.* 完整，完善
anathema [ə'næθimə] *n.* 令人极其讨厌的事
irreversible [,iri'və:səbl] *adj.* 不可逆转的
devastate ['devəsteit] *vt.* 毁坏，破坏
aquatic [ə'kwætik] *adj.* 水生的，水中的
boost [bu:st] *vt.* 推进，提高
principle ['prinsəpl] *n.* 原则，原理
unhitch [,ʌn'hitʃ] *vt.* 解开，放掉
broad-spectrum ['brɔ:d-'spektrəm] *adj.* 用途广泛的，广谱的
subcontinent [,sʌb'kɔntinənt] *n.* 次大陆
leach [li:tʃ] *vt.* 过滤，萃取
incorporate [in'kɔ:pəreit] *vt.* 合并，混合
scorn [skɔ:n] *vt.* 轻蔑，不屑做
dispute [dis'pju:t] *n.* 争论

Why the Great Smog of London Was Anything but Great?

6. 为什么伦敦烟雾事件如此重大?

机经选粹

这一篇讲的是关于伦敦大雾的文章。由于英国的空气污染严重，产生了一种浓雾，对人的健康造成了严重的危害。本文就是关于伦敦大雾使人丧命的调查研究，研究为什么伦敦会有如此大的雾?

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Why the Great Smog of London Was Anything but Great?

In early December 1952, a great mass of cold air moved off the English Channel, draped itself over London like an icy comforter and then simply stayed put.

Trying to keep warm, Londoners piled extra coal into their fireplaces, sending plumes of black, sooty smoke into the air that mixed with clouds of exhaust from factories and coal-burning power plants. But instead of rising into the atmosphere and dispersing, the smoke stayed close to the ground, trapped by the cold air above.

Over the next five days, a city already famous for its smog experienced the worst air pollution it had ever seen. A thick haze hovered over the streets, penetrating

homes and offices. Public transportation nearly ground to a halt, and at night the visibility was so poor that some parts of London became unnavigable. Indoor concerts were canceled because the audiences could not see the stage.

And then the smog lifted and the problems were over. Or so it seemed.

"There was no sense of drama or emergency," said Dr. David V. Bates, who at the time had just started work at St. Bartholomew's Hospital in London. "It was only when the registrar general published the mortality figures three weeks later that everybody realized that there had, in fact, been a major disaster."

Some 4,000 people died of respiratory ailments in those five days, and perhaps an additional 8,000 in the months that followed. Most of the victims were especially vulnerable by reason of age or illness. Now a new study, based on lung tissue samples preserved from the victims of what became known as the Great Smog of 1952, has provided insights into why the smog proved so deadly. It also illustrates the continuing danger of airborne pollutants known as particulate matter, experts said, for which environmental officials in the United States are considering new regulations.

Writing in the journal *Environmental Health Perspectives*, the researchers said they found high concentrations of fine particulate matter in the lungs of 16 people whose deaths were attributed to the smog.

The findings, said the lead author, Dr. Andrew Hunt, confirm the suspicions of the London health authorities from that period.

"The conception was it was the soot in the atmosphere, and coal-burning clearly the obvious culprit." said Dr. Hunt, who led a team of researchers from the State University of New York Upstate Medical University in Syracuse and the Royal London Hospital. He is now a consultant.

In fact, coal combustion probably was the main factor in the deaths, the researchers said. But a close examination of the victims' lung tissue indicated that Londoners were exposed not just to high volumes of ultrafine carbon materials but also to more than a dozen other fine particulate substances, including metals like lead.

Perhaps more significant, the study found concentrations of particles associated with diesel fuel, which remains a major source of air pollution in Europe and, to a lesser extent, the United States. The mass deaths occurred the same year that London completed its switch from electric trams to diesel buses, so it appears that a combination of factors may have made the smog so deadly, although the role of the metals is not yet understood.

The Great Smog is considered a turning point in environmental history. Although there had been other episodes where air pollution was held responsible for a spike in deaths—notably in the Meuse Valley in Belgium in 1930, and in Donora, Pa., in 1948—the numbers were much lower than those in London. In the aftermath, British

officials passed laws banning the emission of black smoke and requiring industry to switch to cleaner-burning fuels.

"Once London hit, it was no longer deniable that air pollution was a big deal and that a small amount of pollution could have a big effect." said Dr. Devra Davis, a researcher at Carnegie Mellon University and the author of *When Smoke Ran Like Water*, a history of air pollution.

While the danger of particulate matter has been demonstrated in many studies, the value of the new report, experts said, is the detailed portrait of pollution exposure it draws by using tissue samples. When the Great Smog occurred, health officials did not monitor air quality, as they routinely do now. That is where the lung samples come in.

"It is allowing us to see what they inhaled." said a co-author of the study, Dr. Jerrold L. Abraham of SUNY Upstate.

By looking at samples from different parts of the lungs, the researchers determined what the victims had been exposed to just before their deaths and over the long term. They also found that some potentially dangerous metals in short-term storage parts of the lung were not in long-term storage parts, suggesting that the metals had been absorbed, and supporting current theories about the dangers of inhaled metals.

Still, the findings are of much more than historical interest, experts said. Janice E. Nolen, director for national policy at the American Lung Association, which helped pay for the study, said they reinforced the need to restrict emissions from diesel fuel and older factories that still burn materials like coal.

"We're still killing thousands of people, unfortunately, with fine particle pollution in this country." Ms. Nolen said.

参考译文

1952年12月初，一大股冷空气穿过英吉利海峡，像一条冰冷的被子裹在了伦敦上空，久久不愿离去。

为了想办法保暖，伦敦人向壁炉里添加了更多的煤块，而这样一来，煤炭的燃烧向空气中释放出了漆黑的烟雾，这些烟雾与以煤为燃料的火力发电厂及工厂里排放的废气在空气中混合。但是这些混合气体并没有上升到大气层中然后消失，相反地，它们被冷空气阻隔，停留在靠近地面的大气中。

接下来的5天里，这个以雾闻名于世的城市经历了有史以来最严重的空气污染。厚厚的烟雾笼罩在街道上空，钻进房子里和办公室里。公共交通几乎完全瘫痪，夜间的能见度很低，以至于伦敦的一些地方到了晚上都无法通行。室内音乐会被取消，因为观众根本看不清舞台。

然后，烟雾散去，所有的问题都解决了。或者至少表面上看是这样。

“没有人感到意外或情况紧急，”当时刚刚开始在圣巴多罗缪医院工作的大卫·V·贝茨医生说道：“直到3个星期后人口登记总署公布了死亡人数，人们才意识到，事实上这里发生了一场大灾难。”

在那烟雾笼罩的5天里，大约有4,000人死于呼吸道疾病，接下来的几个月里又大约有8,000人也因此丧命。大多数遇难者是年老和体弱多病者。近日，一项基于1952年伦敦大雾遇难者的肺部组织标本的研究，深入探讨了为什么那些烟雾会如此致命？专家说，该研究同时也阐明了这种被我们称作是颗粒物质的空气污染物正持续威胁着我们。因此，美国环保部门官员正考虑针对这一问题设立新的法规。

《环境健康展望》杂志上的一篇文章中提到，研究者们在16位因大雾丧生的遇难者的肺里发现了高浓度的细小微粒物质。

这项研究的负责人安德鲁·亨特博士说，这些发现证实了当时伦敦健康管理局的怀疑。

亨特博士说：“当时，专家们认为该物质是悬浮在空气中的烟尘，很明显是煤的燃烧导致了这些烟尘的出现。”亨特博士是一个顾问医师，他领导了一支由来自锡拉丘兹纽约上州医科大学和伦敦皇家医院的研究者们组成的研究队伍。

事实上，研究者们认为煤的燃烧很可能是导致死亡的主要因素。但是在对遇难者肺部组织的详细检查中发现，伦敦人当时生活的空气里不仅仅只含有大量超细含碳物质，同时还有多种其他细小的微粒状物质，包括像铅这样的金属物质。

可能更重要的是，这一研究发现了高浓度的与柴油燃料相关的微粒。这种微粒一直是欧洲空气污染的主要原因。在美国，这种颗粒污染的情况稍微好一些。在完成从有轨电车到柴油巴士的转变的那一年，伦敦也出现了人口大量死亡的现象。因此，看起来是多种因素共同导致了致命的烟雾的产生，尽管现在还没有人知道金属微粒在其中扮演的是怎样一个角色。

伦敦大雾是环保史上的一个转折点。虽然在此之前也发生过其他的环境污染导致人口死亡的事件，特别是1930年比利时马斯河谷烟雾事件和1948年美国宾夕法尼亚州多诺拉市空气污染事件，这些事件中遇难的人数比伦敦大雾遇难的人数要少得多。在这场灾难之后，英国政府通过了禁止排放黑烟并且要求企业改用清洁燃料的法规。

德夫拉·戴维斯博士说道：“一旦灾难降临到伦敦头上，我们就再也不能否认空气污染是一件大事，即使再小的污染都会导致严重的后果。”她是卡耐基—梅隆大学的研究员，著有《浓烟似水》，这是一本空气污染史。

专家们指出，在微粒物质的危害已经经过很多研究证实之后，这个新的研究报告的价值在于，它通过研究肺部组织标本详细地描绘了污染的情况。在伦敦大雾发生的时候，健康部门的官员还没有像现在这样定期检测空气的质量。这就是肺部标本的作用所在。

一位来自纽约上州医科大学的研究成员杰罗德·L·亚伯拉罕博士说：“这样使我们能够看到他们吸入了什么。”

通过观察肺部不同部分的标本，研究人员可以知道死者在去世之前短期内以及长期呼吸的是怎样的空气。他们发现了一些潜在的危险金属，这些金属存在于肺的短期储存部位，而没有出现在肺的长期储

存部位。这说明那些金属物质已经被吸收了，也就使得目前关于吸入金属微粒的危害理论得以证实。

专家们认为这些发现不仅仅有历史意义。美国肺科协会国家政策部主任珍妮丝·E·诺兰还说这些发现也强调了对燃烧柴油和以煤作为燃料的老式工厂所排放的气体进行限制的迫切性。美国肺科协会为这次的研究提供了赞助。

诺兰女士说："不幸地是，在这个国家里，仍有成千上万的人因为微粒污染而丧生。"

核心词汇

drape [dreip] *vt.* 覆盖
comforter ['kʌmfətə] *n.* 被褥，慰问者
pile [pail] *vt.* 装，堆积
disperse [dis'pə:s] *vt.* 分散，散开
trap [træp] *vt.* 堵住，使受限制
unnavigable [ˌʌn'nævigəbl] *adj.* 不能通航的
mortality [mɔ:'tæliti] *n.* 死亡数目
respiratory [ris'paiərətəri] *adj.* 呼吸的
ailment ['eilmənt] *n.* 小病，疾病
particulate [pə'tikjulit] *adj.* 微粒状的
suspicion [səs'piʃən] *n.* 猜疑，怀疑
culprit ['kʌlprit] *n.* 罪魁祸首，罪犯
consultant [kən'sʌltənt] *n.* 顾问
diesel ['di:zəl] *n.* 内燃机，柴油机
smog [smɔg] *n.* 烟雾
emission [i'miʃən] *n.* 排放
deniable [di'naiəbl] *adj.* 可否定的，可否认的
routinely [ru:'ti:nli] *adv.* 通常
sample ['sæmpl] *n.* 样品，样本
storage ['stɔridʒ] *n.* 储藏
inhale [in'heil] *vt.* 吸入，吸气

What Causes a Volcano to Erupt and How Do Scientists Predict Eruptions?

7. 什么导致了火山爆发？科学家如何预测火山爆发？

机经选粹

这一篇是讲火山爆发的。文中首先介绍了火山爆发的原因、带来的危险以及如何预测火山的爆发。

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What Causes a Volcano to Erupt and How Do Scientists Predict Eruptions?

Attila Kilinc, head of the geology department at the University of Cincinnati, offers this answer. Most recently, Professor Kilinc has been studying volcanoes in Hawaii and Montserrat.

When a part of the earth's upper mantle or lower crust melts, magma forms. A volcano is essentially an opening or a vent through which this magma and the dissolved gases it contains are discharged. Although there are several factors triggering a volcanic eruption, three predominate: the buoyancy of the magma, the pressure from the exsolved gases in the magma and the injection of a new batch of magma into an already filled magma chamber. What follows is a brief description of these processes.

As rock inside the earth melts, its mass remains the same while its volume increases—producing a melt that is less dense than the surrounding rock. This lighter magma then rises toward the surface by

virtue of its buoyancy. If the density of the magma between the zone of its generation and the surface is less than that of the surrounding and overlying rocks, the magma reaches the surface and erupts.

Magmas of so-called andesitic and rhyolitic compositions also contain dissolved volatiles such as water, sulfur dioxide and carbon dioxide. Experiments have shown that the amount of a dissolved gas in magma (its solubility) at atmospheric pressure is zero, but rises with increasing pressure.

For example, in an andesitic magma saturated with water and six kilometers below the surface, about 5 percent of its weight is dissolved water. As this magma moves toward the surface, the solubility of the water in the magma decreases, and so the excess water separates from the magma in the form of bubbles. As the magma moves closer to the surface, more and more water exsolves from the magma, thereby increasing the gas/magma ratio in the conduit. When the volume of bubbles reaches about 75 percent, the magma disintegrates to pyroclasts (partially molten and solid fragments) and erupts explosively.

The third process that causes volcanic eruptions is an injection of new magma into a chamber that is already filled with magma of similar or different composition. This injection forces some of the magma in the chamber to move up in the conduit and erupt at the surface.

Although volcanologists are well aware of these three processes, they cannot yet predict a volcanic eruption. But they have made significant advances in forecasting volcanic eruptions. Forecasting involves probable character and time of an eruption in a monitored volcano. The character of an eruption is based on the prehistoric and historic record of the volcano in question and its volcanic products. For example, a violently erupting volcano that has produced ash fall, ash flow and volcanic mudflows (or lahars) is likely to do the same in the future.

Determining the timing of an eruption in a monitored volcano depends on measuring a number of parameters, including, but not limited to, seismic activity at the volcano (especially depth and frequency of volcanic earthquakes), ground deformations (determined using a tiltmeter and/or GPS, and satellite interferometry), and gas emissions (sampling the amount of sulfur dioxide gas emitted by correlation spectrometer, or COSPEC). An excellent example of successful forecasting occurred in 1991. Volcanologists from the U.S. Geological Survey accurately predicted the June 15 eruption of the Pinatubo Volcano in the Philippines, allowing for the timely evacuation of the Clark Air Base and saving thousands of lives.



辛辛那提大学地质学院院长阿提拉·克伦奇给出了这样一个答案。最近，阿提拉克伦奇教授一直在夏威夷和蒙特塞拉特研究火山。

当地球部分的上地幔或下地壳熔化时，岩浆就形成了。火山实质上是一个开口或通风孔，岩浆和它所包含的液化气体

通过这个开口喷流出来。虽然有若干因素会引起火山爆发，但以这3个因素为主：岩浆的浮力、岩浆里蒸发出的气体产生的压力和一批新岩浆往已充满岩浆的封闭空间的注入。以下是对这些过程的简要介绍。

当地球内部的岩石熔化时，其质量保持不变，而体积有所增加，产生了比周围岩石密度低的熔化物。然后，这种较轻的岩浆凭借其浮力上升到地表。如果岩浆的产生区和地表之间的岩浆密度小于周围和上面岩石的密度，岩浆就会上浮，到达地表而喷出。

岩浆的所谓安山质和流纹质成份也含有液化挥发性物质，如水、二氧化硫和二氧化碳。试验表明，岩浆中大量的液化气体的溶解度在大气压强下为零，但随着压强不断升高而增大。

例如，位于地表以下6,000米的饱含水的安山岩岩浆，其5%左右的重量来自于水溶液。当岩浆向地表推进时，岩浆里水的溶解度降低，所以多余的水以气泡的形式从岩浆中分离出来。当移动的岩浆更接近地表时，从岩浆里分离出来的水就越来越多，从而使地幔空隙里气体与岩浆的比例有所增加。当气泡体积达到约占75%时，岩浆碎裂成为火成碎屑(部分熔化的和固态的碎片)，爆炸式地喷发出来。

导致火山喷发的第3个过程是新岩浆注入进一个已充满与岩浆成份相似或不同的物质封闭空间。此过程使一些封闭空间里的岩浆在地幔空隙里向上移动，在地表处喷发。

虽然火山学家们对这3个过程都很清楚，但他们还不能预测火山爆发。尽管在这方面，他们已经取得了重大进展。此过程指的是对一个处于监控中的火山爆发的可能特征和时间进行预测。依据有关火山的史前和历史记录以及它的爆发喷出物，可以预测其爆发时的特征。例如，一次剧烈的火山爆发产生了火山灰雨、火山灰流和火山泥石流(或火山泥流)，在未来，相同的情况有可能再现。

测定处于监测中的火山的爆发时间，取决于对一些参数的测量，包括火山的地震活动(特别是火山地震的深度和频率)，地面变形情况(决定使用倾斜仪和/或全球定位系统及卫星干涉测量法)，还有气体的排放量(抽样测定由关联光谱仪或应用遥测仪排放的二氧化硫气体的量)，但并不仅仅局限于此。一个成功预报的好例子是：1991年，来自美国地质调查局的火山学家们准确预测了6月15日菲律宾皮纳图博火山的爆发，使克拉克空军基地及时撤离并挽救了数千人的生命。

核心词汇

volcano [vɔl'keinəu] *n.* 火山
crust [krʌst] *n.* 外壳，地壳
predominate [pri'dɔmineit] *vt.* 掌握，控制
buoyancy ['bɔiənsi] *n.* 浮力
dense [dens] *adj.* 密集的，密度大的
andesitic ['ændizaitik] *adj.* 安山岩的
rhyolitic ['raiə,laitik] *adj.* 流纹质的
sulfur ['sʌlfə] *n.* 硫
bubble ['bʌbl] *n.* 泡沫
disintegrate [dis'intigreit] *vi.* 碎裂，解体，瓦解
volcanologist [vɔlkə'nɔlədʒist] *n.* 火山学家
mudflow ['mʌdfləu] *n.* 泥流
lahar ['lɑ:hɑ:(r)] *n.* 火山泥流
deformation [,di:fɔ:'meiʃən] *n.* 变形
tiltmeter ['tilt,mi:tə(r)] *n.* 测量地面倾斜度之仪器，倾斜仪
interferometry [,intəfiə'rɔmitri] *n.* 干涉量度学

Yearning for the Sounds of Silence in Workplace

8. 对工作场所寂静之声的渴望

机经选粹

这一篇是关于噪音对人的影响的研究。

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Yearning for the Sounds of Silence in Workplace

Neither employers nor employees can afford to turn a deaf ear to the negative effects of office noise, Marjo Johne writes.

It was a simple fax machine. But to the employee who had to listen to it beep and ring all day, the piece of office equipment was a tool of torture.

"She thought she was going to lose her mind," recalls Shelly Ptolemy, president of Ptolemy & Associates Inc., a Calgary management-consulting firm whose client employed the woman. "And when the employer held a staff meeting, it came out that the fax was driving everyone else crazy, too."

In today's technology-filled workplaces where computers, photocopiers, fax machines and desk phones co-exist with cellphones, pagers and BlackBerrys,it's not unusual for workers to be subjected to a daily orchestra of annoying sounds.

There's the nanosecond-long musical bar that heralds the arrival of e-mail, the bleeps and whizzes of photocopiers, loud squawks from speakerphones, not to mention the various ring tones piping up from everyone's cellphones.

Then there are the human-generated noises, such as whistling in the hallway, boisterous laughter or the Monday-morning gossip in the next cubicle.

In a recent survey of more than 2,300 U.S. workers by Randstad USA, a staffing firm in Atlanta, 32 percent said loud talkers

were their biggest pet peeve in the office, followed by cellphone ring tones (30 percent) and speakerphones (22 percent).

Workplace experts say all these sounds can add up to a lot of stress and tension in the office. And neither employers nor employees can afford to turn a deaf ear to the negative effects of office noise.

"Any noise that interrupts your thought process, any noise that is annoying contributes to the stress of trying to do your job." says Carol Loveridge, executive director of Winnipeg-based MFL Occupational Health Centre Inc., which specializes in work-related health care.

"And when you're stressed and distracted, you just can't be as productive as you'd normally be under quieter conditions."

While most office noise may not be loud enough to damage workers' hearing, research suggests it could have other ill effects on their health and job performance. A 2001 study by a Cornell University environmental psychologist found that people who worked in noisy offices had higher levels of epinephrine, a stress hormone, than those who worked in quiet offices.

The employees in noisy offices also made 40-percent fewer attempts to solve a puzzle given to them as part of the Cornell study.

Experts say that annoying office noises can also strain relationships in the workplace. A Toronto office employee, who asked not to be identified, says the irritating sounds coming out of a co-worker's adjacent cubicle has created tension between them.

"Three to four times a day, she listens to her voicemail on the speakerphone," he complains. "I think that's just really rude."

"Apart from being annoying, this practice makes it hard for him to focus on his work, which includes a great deal of data entry." the employee says. But when he asked his co-worker to stop broadcasting her voicemail, she "sloughed off" his request and so did the department supervisor.

"That's one of the problems with office noise—not everyone thinks it's an issue." Ms. Ptolemy, the management consultant, says. "What one person finds annoying may not even register with someone else."

Some people simply don't realize they're making noise, she adds, while others think it's all right for them to be noisy if they're doing productive work.

"Some people might say: 'It's okay if I've got the speakerphone on because I'm talking to a client about work. But it's not about the content of the conversation. It's about other people's need for a quiet space to work."

Some employers are starting to pay attention to this need, Ms. Ptolemy says. Faced with a labour crunch, many are looking to entice and retain employees by creating more welcoming workplaces. And one of the ways they're doing this is by reducing or at least muffling office noise.

Leslie Frank, president of HFP Acoustical Consultants Corp., says that employers are more aware these days of how office noise can affect their employers' health and

productivity. And they are taking steps to muffle it.

Many companies, particularly large corporations moving into several floors of a new building, are asking acoustical consultants to help them design quieter offices.

And Mr. Frank says that about a third of the companies that ask for his help end up installing ceiling tiles that absorb noise. Some also choose to pipe in "white noise" that neutralizes other sounds.

Companies with open-concept offices are providing "quiet rooms" for workers who need some noise-free hours to work on a project or who just want to take a mental break from the workplace din, Ms. Ptolemy says.

But not all companies can afford to soundproof their offices or provide quiet rooms. So what about just silencing the noise makers?

That's easy enough to do when the source of noise is a piece of office equipment, the experts say. The solution can be as simple as putting up sound-absorbing panels around it or moving the machine to another area.

The latter was what the company with the noisy fax machine opted for, and that restored peace to the workplace, Ms. Ptolemy says.

But silencing human noisemakers isn't that simple. The person who likes to whistle while he works may be offended at the suggestion that he pipe down, she says. The co-worker who keeps a CD player in her cubicle may not get that her daily dose of Mozart isn't music to everyone's ears.

As more companies strive to create pleasant workplaces, telling employees to put a lid on sounds they happen to enjoy isn't something a manager may feel comfortable doing, she observes.

Still, employers should not ignore a worker who complains about annoying office noise, Ms. Loveridge says.

"Do you want to lose that employee? Right now in Canada, no one wants to lose employees, so you need to take that complaint seriously and find a solution."

Many companies today have health and safety committees that can be called upon to find ways to fix the problem, she says. Or managers can just sit down with their staff and ask them to help find a solution that everyone can live with.

Another one of Ms. Ptolemy's clients had a problem with a four-person team. Three of them liked to work to music while the fourth preferred to work in silence. Not wanting to break up the team, the employer found a solution by purchasing headphones for the three employees who liked listening to music at work.

As for cellphones, the experts were unanimous in their advice: Tell your employees to turn them off or put the phones on vibrate.

"That's what the brass at Telus Mobility, where almost everyone has a company-issued cellphone and PDA, have asked their

employees to do." says human resources director Shannon Taylor. "We encourage team members to check their cellphones at the door and switch them to vibrate or silent. It can be cute to hear a ring tone in an elevator, but not in a meeting."

Employees who work in the company's open-concept areas are also "encouraged" to take their cellphone conversations away from their desks to an area where they won't disturb other workers, such as a hallway, Ms. Taylor says.

Ms. Ptolemy says the issue of annoying office noises really boils down to a question of respect.

Employers who allow their workers to toil under a constant assault of irritating sounds are basically showing a lack of respect for their employees' right to work in a pleasant and healthy environment.

"At the end of the day, if employees don't feel they're in a respectful and supportive environment, then they're going to start to ask the question: 'Is this organization for me?' " Ms. Ptolemy says.

"And guess what they're probably going to start looking around for another job."

参考译文

现如今在计算机、影印机、传真机、台式电话和手机、携带式传呼机、"黑莓"移动电子邮件系统终端这些科技产品同时存在的工作场所里，员工每天听到像管弦乐队发出的恼人的声音已不是什么稀奇事。

办公室里有提示电子邮件到达的毫微秒长的音乐小节声，有影印机发出的哔哔声和嗖嗖声，有扬声器喧闹的刺耳声，更不用说每个人手机发出的各种各样的铃声了。

还有人类发出的噪音，比如走廊里的口哨声，隔壁办公室里吵闹的笑声或是星期一早晨的闲聊声。

在亚特兰大职业中介机构美国任仕达公司最近对2,300多名员工所做的一项调查中，32%的人说他们在办公室里最大的烦恼是听到大声谈话的声音，30%的人说是手机铃声，22%说是扬声器。

工作场所环境研究的专家说，所有的这些声音会给办公室增加很大压力和不安。而且老板和员工都不可能对办公室噪音的消极影响置若罔闻。

卡诺·洛夫里奇说道："任何噪音都会打断你的思路，任何恼人的噪音都会为你的工作增加压力。"她是温尼伯MFL职业健康中心有限公司的执行董事，这个公司专门从事与工作相关的健康保健。

"而且，当你感到有压力和注意力不集中时，你不可能像在安静一些的环境里做事那样有效率。"

虽然大多数办公室噪音并不足以大到损害员工们的听觉，但研究表明，它会损害他们的健康，影响他们的工作绩效。

康奈尔大学的环境心理学家们于2001年所做的一项研究发现，在嘈杂办公室里工作的人的肾上腺素——一种应激激素——都比那些在安静办公室里工作的人要高。

嘈杂办公室里的员工在解决一个给他们的难题时，也少做出40%的尝试。这也是康奈尔研究内容的一部分。

专家说，恼人的办公室噪音也可以令工作场所里的人们的关系变得紧张。一位匿名的多伦多办公室员工说，从同事毗邻的小室(大房间中隔出的)发出的使人烦躁的声音造成了他们之间关系的紧张。

这位员工说，除了使人烦躁，这种噪音还让他难以集中注意力去做包括大量数据输入的工作。但是，当他叫同事关上他的话匣子时，她“回绝”了他的请求，部门主管也不答应他的请求。

“这是办公室噪音的问题之一，但并不是每个人都认为它是一个问题，”管理咨询师托勒密女士说：“对于有人认为烦人的东西，其他人可能甚至都没有注意到。”

她补充说，有些人完全没有意识到他们正在制造噪音，而其他人认为如果他们工作效率很高的时候，吵一点是没有关系的。

托勒密女士说，有些老板开始注意这个需求了。面对劳动力危机，许多老板通过创造更加令人满意的工作场所来诱惑和保留员工。他们采取的措施之一就是减少至少是隔离办公室噪音。

HFP声学咨询公司的董事长雷斯利·弗兰克说，目前老板们更加意识到办公室噪音会影响他们员工的健康和工作效率。而且他们正在采取措施隔离它。

许多公司，特别是那些搬进一栋新建筑并占用几层楼的大公司，正在让声学咨询师们帮助他们设计更安静的办公室。

弗兰克先生说，大约三分之一向他寻求帮助的公司最终都安装了消音的天花板瓦片。有一些还选择了用电讯设备传送“白色噪音”来抵消其他声音。(白色噪音是声学中的名词，它一般是用来进行某些声学测试而人为产生的一种标准“噪音”，其实就是指相同响度的、在人耳可听见的声音频率范围内的各种频率的声音的“集合”。也就是说，它是由仪器同时发出的响度相同的、音调由低到高的所有声音。这是一种形象的叫法，是从“强度相同的所有色光合成到一起而给人的感觉是‘白色光’这一很常见的现象”引申而来的。)

有的公司不但配有宽敞明亮的开放式办公室，还会提供一些“安静的房间”给那些需要无噪音时段去着手于一项工程的员工，或是只想从工作场所的喧闹中得到精神放松的员工，托勒密女士说道。

但并不是所有公司都承担得起给办公室隔音或提供安静的房间。那么，使噪音制造者安静下来怎么样?

专家说，当噪音来源是办公室里的一台设备时，这就很容易了。只需安上消声板或把机器移到别的地方就可以简单地解决这个问题。

带有嘈杂的传真机的公司选择了后一种方法，这让工作场所恢复了平静，托勒密女士说道。

但是，要令人类噪音制造者安静下来就没那么容易了。她说，工作时喜欢吹口哨的人会被叫他安静下来的建议惹得不高兴。在办公室里放CD机的同事不会意识到她每天放的莫扎特的音乐不是对每个人来说都那么入耳。

她观察到，尽管越来越多的公司努力创造更加令人愉悦的工作环境，但告诉员工要停止他们碰巧喜欢的声音还是令经理难以启齿。

虽然如此，老板们仍然不应该忽视任何一位员工对恼人的办公室噪音的抱怨，洛夫里奇女士说道。

她说，现在许多公司都有健康和安全委员会，可以调用它们来寻找解决问题的方法。或者经理可以与员工们坐下一起谈

一谈，让他们帮助去寻找一种大家都能接受的解决办法。

托勒密女士的另一个客户遇到了一个关于四人团队的问题。他们中的三人喜欢边听音乐边工作，而另一个喜欢在安静的环境下工作。老板不想解散这个团队，最终找到了一个解决办法，给那三个工作时喜欢听音乐的员工购买了头戴式耳机。

对于手机，专家们意见一致：让员工们把手机关掉或是调成振动。

人力资源主管夏依·泰勒说："在研科传动公司(Telus Mobility)，几乎每个人都有公司生产的手机和个人数字助理(PDA)，他们的高级人员已经让员工们照专家所说的那样做了。我们鼓励小组成员们在门口检查他们的手机，把它们调成振动或静音。在电梯里听见铃声可能很惬意，但要在会议上听见则不会。"

泰勒女士说，在公司的开放区域里工作的员工们同样被"鼓励"到一个远离办公桌的地方去打手机，比如走廊，这样他们就不会打搅到其他人。

托勒密女士说，恼人的办公室噪音问题归结起来实际上是尊重问题。

让员工在持续受到恼人噪音侵扰的环境下辛苦工作的老板们根本上就是对员工在愉快和健康的环境里工作的权利缺乏尊重。

核心词汇

photocopier ['fəutəukɔpiə(r)] *n.* 影印机
orchestra ['ɔ:kistrə] *n.* 管弦乐队
nanosecond ['nænəu,sekənd] *n.* 十亿分之一秒
bleep [bli:p] *n.* 哔哔声
hallway ['hɔ:lwei] *n.* 走廊
boisterous ['bɔistərəs] *adj.* 喧闹的，狂暴的
epinephrine [,epi'nefrin] *n.* 肾上腺素
voicemail ['vɔismeil] *n.* 语音信箱
slough [slau] *vi.* 蜕皮，脱落
crunch [krʌntʃ] *n.* 咯吱声，咬碎声
entice [in'tais] *vt.* 诱骗，引诱
neutralize ['nju:trəlaiz] *v.* 压制
soundproof ['saundpru:f] *adj.* 隔音的
noisemaker ['nɔiz,meikə(r)] *n.* 发出大声音的人，会高声喧闹的人
vibrate [vai'breit] *vi.* 震动
elevator ['eliveitə] *n.* 电梯
annoying [ə'nɔiiŋ] *adj.* 恼人的，讨厌的

UK Gets Pat on Back from WWF

9. 英国受到世界野生动物保护基金会的称赞

机经选粹

这一篇是关于欧洲森林保护问题的。野生动物保护基金会组织举行了会议以讨论欧洲森林现状以及如何保护的问题；出台了保护环境的政策：保护所有欧洲的森林资源，保护树木的品种。国家要加大资金投入力度以保护现有的森林资源。

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UK Gets Pat on Back from WWF

The UK is leading the way on forest protection in Europe. It is one of the few countries that has made progress in managing its forests sustainably, said Tessa Robertson head of WWF-UK's forest programme. She was quoting from a new report published by the global environment network on the State of Europe's forest protection.

Timber and other wood products from all our state forests are now certified by the FSC, she said, adding, however, on the protection side, the UK's few remaining areas of semi-natural woodland continue to be threatened. Ancient woodland was especially at risk, with development pressures seen as a major concern. In the last two years, the number of planning applications which could affect them had more than doubled, Ms Robertson said.

The WWF report, which uses scorecards to assess protection and management performance changes, reveals that some countries—notably the UK and Slovakia—

had shown progress in managing their forests.

"There has been an improvement in the UK." said Beatrix Richard, WWF European forests officer. "However, less than 2% of ancient woodlands remain in this country and our forest plants and animals continue to decline at an alarming rate." she added.

WWF is concerned that continued emphasis on management could lead to the loss of Europe's remaining wilderness areas. "There seems to be a belief that conserving Europe's forests can be achieved by management alone." Ms Robertson said.

Meanwhile, addressing ministers and delegates from across Europe at the Living forest summit in Vienna on April 28, Elliot Morley, forestry minister, England said that the results of the WWF report reflected the huge strides taken in the UK in recent years in making its forestry sustainable. He praised the work going on across the country to revitalize Britain's woodland heritage.

The report appraised the action taken by 16 European countries towards increasing the protection of endangered European forest types. It was pleasing to see that the WWF had ranked the UK along with Latvia as the two best performing countries in terms of significant improvement since 2000. It was, Mr Morley added, one of the five countries mentioned in the report as leading the way in good forest management.

Acknowledging the WWF's call for all countries to do more, the minister said that the UK's top ranking was a tribute to the work of people across the forestry sector. The result is down to the hard work of the broad coalition of private owners, industry and non-governmental organisations who, in recent years, have worked closely with the UK government to increase the area and quality of forests.

Mr Morley went on to call for action to halt forest degradation and deforestation and for governments to forge partnerships with businesses both at home and overseas. He paid tribute to the work done since Europe's first such conference in Strasbourg four years ago.

The forum should be proud not only of the significant achievements made locally but also of its contribution to the global consensus, he said. It is the action we will take tomorrow and in the coming years to implement our commitments that will be important for Europe and, indeed, for the outlook for forests globally.

We know that forests cover over 30% of the world's land surface and provide a wide range of benefits. Equally, we know that forest degradation and deforestation continue at an alarming rate, he said. As policy-makers and politicians, we have to act now to seize the opportunities and threats facing not only the forest but also the people who depend on them. Mr Morley listed achievements made in UK forests in recent years. These included 100% certification of public forests, drives to promote the use of timber from well-managed forests such as the Wood for good campaign and action to

combat illegal logging and trade in illegally logged timber.

Speaking on the eve of the Vienna meeting—officially, the fourth Ministerial conference on the protection of forests in Europe (MCPFE), Mrs Robertson said: The fact that most of the ministers attending are from agriculture, rather than environment ministries, seemed to demonstrate that management alone was the main criterion. But we know that protected areas are essential if we are to conserve the animals and plants that rely on wild and semi-natural forests.

Traditionally, the MCPFE conference—this year organised by the forestry ministers of Norway, Austria (whose Josef Proll chaired it), Poland and Portugal—has focused solely on forestry conservation through sustainable management. However, in Vienna, concern was expressed that, as a consequence of this practice, countries are failing to protect many of Europe's rarest and most fragile ecosystems.



Emphasising that forests must fulfil a wide variety of roles reflected by a forward-looking policy, Josef Proll said: Two weeks ago, I initiated the dialogue between political decision-makers, economic, scientific and environmental groups which, in Austria, will realise the European objective of co-operation.

In the Vienna declaration, the ministers agreed to continue actively to implement international resolutions on global issues of importance to forests (such as climate protection and biological diversity). A work programme will now be developed for all resolutions passed at the Living Forest Summit to translate these issues into a concrete course of action.

Harnessing the potential of forests as a source of renewable energy and as a substitute for non-renewable resources is an issue of particular interest to the Austrian minister. He said that his country was a front-runner in this area, particularly relating to the construction and energy sectors.

As a sting in the tail from the host country to the Vienna accord, the Austrian Forest Owners' Association attacked a recent WWF press release which had claimed that whole hillsides are being clearfelled in its Steiermark and in Karnten' regions. This is hair-raising nonsense and every Austrian can reassure himself of the falseness of this statement, said the body's secretary-general Christian Brawenze.

Austria had one of the strictest forest laws in Europe, he said, which effectively forbade clearfelling. All that is allowed are small clearings of half-a-hectare..

Describing the WWF's talk of large areas as absurd and mischievous, he said that Austrian family forestry practice is steeped in tradition working on a small scale and near to nature. The height of cheek was WWF's promotion of FSC certification as the only protection against clearfelling. Instead, said Dr Brawenze, it should recommend the family practice option.



参考译文

“欧洲国家中，英国在森林保护方面处于领先地位。”世界野生动物保护基金会英国分会主席泰萨·罗伯逊说道：“英国是为数几个在持续性管理和经营森林资源方面取得进展的国家之一”。她引用的是一份由全球环境网就欧洲森林保护现状所作的新报告。

世界野生动物保护基金会的报告显示：英国和斯洛伐克已经在森林资源管理和经营方面取得了显著的成就。此报告是利用记分卡的形式来评价各国在森林保护和管理方面所做的转变的。

世界野生动物保护基金会欧洲森林部官员比阿特丽克斯·理查德说道：“英国在这方面有显著的改善。”她进一步强调说：“然而该国仅存的原始森林少于2%，且森林植被和动物正以令人担忧的速度持续减少着。”

世界野生动物保护基金会认为持续地关注管理和经营方面的问题将导致欧洲剩下的野生区域的丧失。罗伯逊夫人说道：“大家似乎认为只需管理就能保护好欧洲森林”。

同时，4月28日在维也纳举行的现存森林峰会上，英格兰森林资源部长艾略特·摩利向整个欧洲的部长和代表致辞时说：“世界野生动物保护基金会的报告反映了英国近几年在持续发展森林资源方面所取得的巨大进步”。他赞扬了该国在振兴英国森林土地遗产上所做的工作。

该报告评估了欧洲16个国家在加强保护欧洲濒危森林的活动中所采取的行动。世界野生动物保护基金会根据自2000年以来取得的重大进展，把英国和斯洛伐克列为表现最好的两个国家，这是令人高兴的。摩利先生进一步说：“在森林管理方面表现良好、处于领先地位的五个国家中，英国是其中之一。”

“为了感谢世界野生动物保护基金会号召各国做出更多的努力，”部长说：“英国取得第一名的位置是对森林部全体同仁工作的回报。这样的成绩来自于私企拥有者、工业和非政府组织这个广泛联盟的辛劳工作。在最近几年里，非政府组织一直同英国政府在处理扩大森林面积和提高森林质量的问题上并肩战斗。”

摩利先生继续呼吁人们为终止森林锐减而采取行动，呼吁政府加强与国内外企业的合作。他赞扬了自从四年前欧洲在斯特拉斯堡第一次举行这样的会议以来人们所做的工作。

他说：“论坛不仅应该以欧洲所取得的重大成就为荣，也应该以它在为达成全球共识上作出的贡献为荣。这是我们未来的行动。在接下来的日子里，我们以此来履行我们的诺言，这对欧洲甚至全球森林都有着重要意义。”

“我们知道森林覆盖着世界上30%的土地面积，给人类带来一系列的好处。同时，森林锐减和森林采伐仍以惊人的速度持续着，”他说道：“作为政策制定者和政治家，我们必须马上采取行动，抓住机遇和排除危险来面对森林以及以此为生的人们”。摩利先生列举了近几年来英国在保护森林方面取得的成就。这些包括对公有森林做百分百的保护，促使人们使用来自管理经营得当的森林的木材。比如一些在打击非法开采原木和非法木料交易中采取有效措施的森林。

罗伯逊夫人在官方名为第四次欧洲森林保护部长会议的维也纳会议上说：“与会部长

多数来自农业部门而不是环境部门，这个事实似乎说明管理经营才是主要的标准。但是我们知道，如果我们要保护好这些依靠野生森林和半野生森林生存的动植物，我们就必须建立一些保护区。”

从传统上来说，欧洲森林保护部长级会议仅仅关注于对森林资源保护采取持续性的管理。本次会议由挪威、奥地利(约瑟夫·普罗尔为主席)、波兰和波多黎各的森林部长组织。然而，在维也纳，人们对各国并没有以此保护欧洲许多稀有和脆弱的生态系统很是担心。

约瑟夫·普罗尔强调，森林应该起到更广泛的作用。这些作用在一个有远见的政策中有所反映。他说道：“两星期之前，我在奥地利同政策制定者、经济家、科学家和环境组织第一次就这个问题展开对话，该对话将达到欧洲合作的目的。”

在维也纳的声明中，部长们同意继续积极主动地执行将森林作为全球重要性话题的决议(例如森林在调节气温和保护生物多样性中所起的作用)。将开发一个把峰会上通过的各项决议予以实施的项目，把这些论题转变为行动的具体路线。

对奥地利部长来说，利用森林的潜能作为可再生能源和不可再生资源的替代品这个论题是很有趣的。他说道，在这一方面，特别是在与建筑和能源有关的方面奥地利是先行者。

近期，奥地利森林拥有者协会攻击了世界野生动物保护基金会出版社最近发表的一个报道。该报道声称斯蒂尔马克和卡尔顿地区的所有山地将会被砍光。从东道主到与会国维也纳，感觉此举如同芒刺在背。该协会的秘书长克里斯蒂安·布朗文说道：“这是令人发指的荒唐言论，每一位奥地利人都可以肯定这种说法是不正确的。”

核心词汇

sustainably [sə'steinəbli] *adv.* 可持续地
scorecard ['skɔ:kɑ:d] *n.* 记分卡
alarming [ə'lɑ:miŋ] *adj.* 惊人的，吓人的
wilderness ['wildənis] *n.* 荒野
conserve [kən'sə:v] *vt.* 保护，保存
minister ['ministə] *n.* 部长，大臣
delegate ['deligit] *n.* 代表，代表团成员
stride [straid] *n.* 大步，步法
revitalize [ri:'vaitəlaiz] *vt.* 使复活，使重新充满活力
endangered [in'deindʒəd] *adj.* 有危险的，有灭绝危险的，将要绝种的
tribute ['tribju:t] *n.* 称赞，颂词，(表示敬意的)礼物，贡品
degradation [ˌdegrə'deiʃən] *n.* 退化，降低，恶化
deforestation [diˌfɔris'teiʃən] *n.* 森林开伐，采伐森林
forum ['fɔ:rəm] *n.* 论坛，讨论会，(电视等的)专题讨论节目
commitment [kə'mitmənt] *n.* 委托，承诺，保证
certification [ˌsə:tifi'keiʃən] *n.* 证明，保证，鉴定
rely [ri'lai] *vt.* 信赖，依靠，指望
ecosystem [i:kə'sistəm] *n.* 生态系统
implement ['implimənt] *vt.* 执行，使生效，履行
recent ['ri:snt] *adj.* 近来的，新近的

Antarctic Icebergs: A Source of Fresh Water?

10. 南极冰山：淡水的来源？

机经选粹

这一篇是说冰山的。南极冰川是最大的淡水资源地，人类水不够了，去冰川取水，开采南极的水资源。文中还介绍了运输冰川的方法：开始说了一种费用比较高的方法，然后发明了一种比较节省能源的方法。

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Antarctic Icebergs: A Source of Fresh Water?

Clean fresh water is a very scarce commodity in many parts of the world. One proposed solution to chronic water shortages is to tap into the world's largest source of fresh water—icebergs.

A whopping 70 percent of the world's fresh water is locked up in polar icecaps. Icebergs, which calve off these icecaps, are composed of extremely pure fresh water from the accumulation of centuries of snowfall.

Antarctic icebergs are considered better than the Arctic variety because they are flatter, more stable, and more accessible. Trillions of cubic meters of ice drift north from Antarctica annually and simply melt away. A ninety kilometre by thirty-five kilometre piece which drifted along the Antarctic Peninsula in 1977,

for example, contained enough water to supply fresh water to Washington, D.C., for thousands of years.

An Old Idea

Using icebergs as a source of fresh water is hardly a novel idea. In 1773, Captain James Cook collected fifteen tons of fresh water from Antarctic icebergs for his ship: The Resolution, and today, Alaskan icebergs are harvested and sold as gourmet ice cubes in Japan.

The idea of harvesting large Antarctic icebergs was originally put forward in the 1940s. In 1977, over 200 scientists and private firm representatives from eighteen countries attended a conference in Iowa to discuss the Antarctic iceberg idea. At the time, it was estimated that the cost per cubic metre of iceberg water might be half that from desalinization plants run on fossil or nuclear fuel. More recently, a pair of Southern California entrepreneurs have developed a plan to tow an iceberg to Los Angeles with possible financial backing from Saudi Arabia.

New Technology

Harvesting icebergs would involve using satellite technology to find icebergs of about 100 million cubic meters (1 km × 400 m × 250 m), considered the optimum size for both handling and cost recovery. Once located, a bow would be cut in the iceberg and a special kevlar covering wrapped over it to reduce melting. Powerful tugs would tow it along favourable ocean currents to its destination. A trip to Southern California or Saudi Arabia would take about a year, with a 20 percent loss due to melting. A trip to Australia would take about three months.

On arrival, an iceberg would be cut up and melted down, with the water piped to irrigation systems and city reservoirs. The difference in water temperature between sea water and the ice could even potentially be used to generate electricity.

Potential Hazards

Harvesting Antarctic icebergs is not, however, a worry-free enterprise.

Antarctica is extremely sensitive to environmental damage. The 1959 Antarctic Treaty was designed to protect the region from environmental damage. Activity from iceberg tugs would increase the likelihood of fuel spills, which, due to the ruthless climate and remote location, would be extremely costly and difficult to clean up.

An iceberg in tropical waters, where it could generate its own foggy weather, would also become a navigation hazard of gigantic proportions. Icebergs could also be threats to local marine ecosystems in more temperate climates. Moving through shallow seas, an iceberg could cool down the surrounding waters or scrape the bottom, damaging marine life. Ice cold fresh water runoff would also reduce the salinity of the surrounding sea water and could precipitate a sudden change in temperature.

And what happens to an iceberg dependent region when its main water supply is lost at sea? A thirsty region could be devastated if its primary source of water did not arrive.

California—a Water-Dependent Desert

In Southern California, a generation of civil engineering technology has built dams, aqueducts, and irrigation systems to supply water for urban expansion and desert agriculture. This has allowed the population to mushroom in an area where such development could otherwise not have occurred.

The area's recent five-year drought jolted Californians into realizing their vulnerability to water shortages, despite all the man-made water systems. Many looked towards newer generations of technology such as desalinization plants and iceberg harvesting to solve water problems created by a previous generation of technology. Unfortunately, these newer solutions have overlooked less popular though no less necessary conservation measures.

Strong farm lobby groups insure that a disproportionate share of California water goes to irrigation. Inappropriate crops, such as rice, waste large quantities of water. Curbs on irrigation and conversion to more appropriate crops would go a long way towards reducing water needs. In urban areas, development freezes, further restrictions on lawn watering and swimming pools, and more efficient appliances, toilets, and shower heads, would also reduce demand.

Weighing Costs and Benefits

Harvesting Antarctic icebergs as a renewable source of clean fresh water for Southern California and other areas is a fantastic idea. However, no advance in technology is without some potential cost to the environment. A simpler solution might be to reduce the demand for water in desert areas by imposing better conservation measures and to restrict urban expansion and inappropriate agricultural practices.



洁净的淡水在世界的许多地方都是稀缺商品。对于水的长期缺乏问题，其中一个推荐的解决方法就是开发世界上最大的淡水资源——冰山。

世界上极大一部分大约70%的淡水资源都封锁在两极的冰盖中。从这些冰盖中分离出来的冰山是由几世纪来降雪中极度纯净的水积累而成的。

人们认为南极冰山比北极冰山更好，因为它们更平坦、更稳而且更容易接近。每年有数万亿立方米的冰从南极洲漂流出来并融化散开。举例来说，1977年，一个宽35公里长90公里的冰块沿着南极洲半岛漂流，其中包含了可供华盛顿使用几千年的淡水。

一个旧想法

用冰山作为淡水资源并不是一个新奇的想法。早在1773年，詹姆斯库克船长为了他的船 “决心”号，就从南极的冰山中收集了15吨纯净水。如今在日本，阿拉斯加冰山被获取并当作美味冰块销售。

开发南极大冰山的想法最初是在20世纪40年代提出来的。在1977年，有来自18个国家的200多个科学家和私营企业代表来到爱荷华州参加讨论开发南极冰山的会议。据估计，那时开发每立方米冰山水的费用可能是在化石或者原子核燃料中种植脱盐植物所用花费的一半。在更近的一段时间，两位来自南加利福尼亚的企业家制定了一个计划——在沙特阿拉伯的财政支持下把冰山拖运到洛杉矶。

新科学技术

获取冰山包括动用人造卫星去搜索1亿立方米大小(1km × 400m × 250m)的冰山，这是考虑操作方便和成本回收的适宜尺寸。一旦定位，使用一个弓形的物体切入冰山，为了减少融化，再将冰山用一种特殊的克维拉纤维布包住。有巨大力量的拖船会随着海水的流向将冰山拖到目的地。到南加利福尼亚或者沙特阿拉伯半岛的行程大约需要一年时间，在此过程中融化会带来20%的损失。到澳大利亚则要大约三个月。

到达目的地后，就切碎或融化冰山，并通过水管将水输入灌溉系统和城市水库中。海水和冰块的温差甚至使它们有用来发电的潜力。

潜在的危险

然而，开发获取冰山并不是一个没有危险的行业。

南极洲对环境损害非常敏感。1959年已制定的南极洲条约就是用来保护其领域免遭环境损害的。由于恶劣的气候和偏远的方位，拖冰山的举动将会增加燃料溢出的可能性，一旦出现上述情况，要清理干净的花销会非常大，也很困难。

冰山处在热带海水中，这个地方本身会产生独有的多雾天气，而且也会极易形成航海危险地区。即使在比较温和的气候中，冰山也已经对当地的海洋生态系统造成威胁。如果从浅海穿过，冰山会降低周围海水的温度或者刮到海的底部并破坏海洋生物。冰可以将流过的海水变冷而且会降低水周围海水的盐分，并使海水温度陡变。

如果主要的清水供应在海洋中就损失了，那么依靠冰山的区域会发生什么事情呢？

如果主要水资源没有到达，那么干旱的区域有可能被破坏。

加利福尼亚——一个依靠水的沙漠

在南加利福尼亚，为了给城市的扩充和沙漠农业提供水资源，人们用一代土木工程技术已经建造了水坝、水渠和灌溉系统，此举让那些地区的人口迅速增长。在这些地区还没有兴建这些水利之前，这种发展也不会存在。

尽管拥有所有这些人造的淡水系统，此地区最近5年来的干旱已使加利福尼亚州人动摇，并且他们明确的认识到水资源缺乏的弱势。许多人期待看到新一代的科学技术，例如：用来解决由上一代科学技术带来的水资源问题的脱盐种植和冰山开发。不幸的是，虽然有那么多的保护措施，这些新的解决办法并没有那么受欢迎。

强大的农民议员组确信加州水资源不成比例地分给了灌溉这一块。不适合的农作物，比如：大米，就浪费了大量的水。控制灌溉，种植更合适的农作物对在减少水资源的需求上有长远的帮助。在城区，控制发展，进一步限制草地灌溉、游泳池用水，使用更有效的器具、厕所、沐浴喷头等，也都会减少水的需求量。

权衡利弊

对于南加利福尼亚来说，南极冰山是洁净水的一种可更新的资源，而在其他地区，获取冰山是一个奇妙的想法。然而，任何新的科学技术都少不了对人类环境的一些潜在破坏。有一种更简单一些的解决办法，那就是通过强制实施一些更保守的措施来减少干旱地区对水的需要，限制城市的扩张以及不适当的农业操作。

核心词汇

scarce [skεəs] *adj.* 缺乏的，不足的

icecap [aiskæp] *n.* 常积不消的冰，冰盖

calve [kɑ:v] *vi.* 分离

accumulation [əkju:mjʊ'leiʃ(ə)n] *n.* 积聚，累积

flatter ['flætə] *vt.* 奉承，阿谀

gourmet ['guəmei] *n.* 美食者

satellite ['sætəlait] *n.* 卫星

optimum ['ɔptiməm] *adj.* 最适宜的

reservoir ['rezəvwɑ:] *n.* 水库，蓄水池

tug [tʌg] *v.* 用力拉

likelihood ['laiklihud] *n.* 可能性

temperate ['tempərit] *adj.* 温和的，适度的

aqueduct ['ækwidʌkt] *n.* 高架渠，渡槽

drought [draut] *n.* 干旱

disproportionate [ˌdisprə'pɔ:ʃənit] *adj.* 不成比例的

appliance [ə'plaiəns] *n.* 器具，器械

inappropriate [ˌinə'prəupriit] *adj.* 不适当的，不相称的

Water Resources

11. 水资源

机经选粹

这一篇讲的是水利发展。文中首先介绍了古代的水利设计。近代灌溉系统的发展满足不了不断加大的水利需求，很多国家和地区水资源严重缺乏，人们择水而居，还有建筑堤坝也造成了环境问题。呼吁人们要节约用水加强水利方面的基础性建设。

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题源全文

Water Resources

Ancient civilizations developed along rivers that supplied water for farming. As early as 5000 B.C., the Egyptians cultivated land made fertile by the floodwaters of the Nile River. By about 3000 B.C., they had built an elaborate canal system that carried water from the Nile to their fields. Large irrigation systems also had been constructed by then in China, India, and southwest Asia. Indians in Mexico and Peru used water from streams to grow corn as early as 800 B.C. When the Spaniards arrived in those countries during the A.D. 1500's, they found great civilizations based on irrigated agriculture. Archaeologists have discovered evidence of early irrigation ditches in the South-western United States. These ditches date from before the 600's. Scientists estimate that Indians of that period irrigated thousands of acres or hectares of land in what became central Arizona.

The 20th century has witnessed unprecedented rises in human populations, from 2.8 billion in 1955 to 5.3 billion in 1990 and is expected to reach between 7.9 and 9.1 billion by 2025 (Engelman and LeRoy, 1993). Consequently, human demands for water, for domestic, industrial and agricultural purposes, are also increasing rapidly. The amount of water that people use varies, but tends to rise with living standards. In the United States, each individual typically uses 700 liters per day for domestic tasks (drinking, cooking and washing), whilst in Senegal, the average use is 29 liters per day. In general, 100 liters per person per day is considered

a minimum threshold (Falkenmark and Widstrand, 1992) for personal use. However, when agricultural and industrial uses are included, countries with less than 1,700 cubic meters (m^3) per person per year (about 4,600 liters per day) are considered to experience water stress, those with less than 1,000 m^3, water scarcity (World Bank, 1992). Because of the spatial mismatch between water resources and people, it is predicted that by 2000, (using the African continent as an example) twelve African countries, with a total population of approximately 250 million will suffer severe water stress. A further ten African countries will be similarly stressed by the year 2025 containing some 1.1 billion people, or two thirds of Africa's population, while four (Kenya, Rwanda, Burundi and Malawi) will be facing an extreme water crisis.

With such a water crisis facing many countries, it seems an immense task just to manage water so that there is enough for people to drink, let alone enough for agricultural, environmental, and industrial uses. The situation is often presented as a conflict of competing demand, as though it was a matter of choice, say, between water for people, or for wildlife, or for the environment. More attention needs to be given to the role of natural ecosystems in managing the hydrological cycle and their potential as alternatives to major engineering works. As an example, well-managed headwater grasslands and forests reduce runoff during wet periods, increase infiltration to the soil and aquifers and reduce erosion, such as sustaining flows during drought periods and reducing runoff during floods. Conserving wetlands in particular, by ensuring that they have adequate supplies of water to maintain their functioning, can be a positive benefit to humanity. Many wetlands provide important fisheries, arable and pasture land, fuelwood and medicines as well as habitats for wildlife. Some wetlands also perform many important natural hydrological functions including flooding reduction, water quality improvement by removing pollutants and groundwater recharge. Thus for the millions of people worldwide who depend directly on wetland resources or benefit from wetland functions, providing water for the environment and for people are one and the same.

When water resources are used at a rate greater than they are being replenished, the resource will decline and the usage becomes unsustainable. In many areas of the world, for example, groundwater is being extracted from the underlying aquifer more rapidly than it is being replenished. Around Quetta in Pakistan, where the abstraction rate is 2.5 cubic meters per second(cumecs), whilst the recharge rate is 2.0 cumecs, the groundwater level is falling at around one meter per year (*Acreman, 1993*). Furthermore, the problem is likely to worsen as the population is growing at seven percent per year (i.e. a doubling in ten to 11 years). In some areas of Libya, no recharge currently occurs, the sustainable use rate is zero and thus the water is effectively being mined. Even where

groundwater abstraction might be reduced to equal the recharge, the groundwater levels have often been lowered to a point where key ecosystems have been destroyed. For example, pumping of the aquifer to supply the rapidly expanding population of Amman in Jordan has led to degradation of the Azraq oasis (*Fariz and Hatough-Bouran, this volume*). Similarly, intensive use for irrigated agriculture of the water from aquifers underlying the upper Guadiana river basin in central Spain (Figure 1) has resulted in almost complete and irreversible destruction of the Tablas de Daimiel wetlands (*Llamas, 1988*). Part of the problem is that planning has often taken place by deciding first how much water is needed and then trying to find a source. In contrast, the opposite process is likely to lead to more sustainable water use, by first assessing the available water resource and then deciding how best it can be used.

There is a need to develop a broad-based approach to water management, with greater emphasis on integrated regional planning and conservation of critical habitats. The environment is composed of a set of physical, chemical and biological components, including water, oxygen, plants, animals, soils, minerals. Each plays an important role either providing structure, such as rocks, or through interaction with other components, maintains crucial processes, such as energy flow or nutrient cycling. Superimposed on this natural environment is the effect of human beings. There is no place on earth unaffected by human beings, who have had large scale impacts on the earth's environment ever since agriculture began thousands of years ago. The ecosystem management approach aims to integrate all the important physical, chemical and biological components and processes which interact with social, economic and institutional factors. This requires integrated management of mountains, drylands, forests, agriculture, housing, industry, transport, waste disposal, aquifers, rivers, lakes, wetlands and anything which has an effect on the environment. Once the scientific basis for management options has been defined by professional staff, the participation of local communities, farmers, industry and conservation organizations is needed to satisfy the needs of different interest groups.

Institutions at various levels are essential for equitable allocation of water. Whatever the level, institutions need well-informed members who have an appreciation of the wide range of issues facing water resource allocation. Training is an essential element, but training needs vary with the type of institution. Professional technical advisors require formal training courses, for example, on water resource planning and wetland management, whilst local community representatives may be best trained with involvement in local activities, such as participatory rural appraisal or through visits to demonstration projects.



参考译文

古代文明是沿着为农业提供水资源的河流发展壮大的。早在公元前5000年，尼罗河的洪水使埃及大量的耕地变得肥沃。大约在公元前3000年，埃及人就已经建立了一个布局精密的灌溉系统，将水从尼罗河引入其农田。那时，中国、印度和西南亚地区也已经建造出大型的灌溉系统。早在公元前800年，墨西哥和秘鲁的印第安人就利用溪水来种植玉米。公元16世纪，西班牙人就到达了上述这些国家，他们发现了建立在灌溉农业基础上的伟大文明。考古学家们在美国西南部找到了有关早期灌溉沟渠的证据。这些沟渠可追溯到7世纪之前。科学家们估计，那时的印第安人灌溉了数千英亩或公顷的土地，即后来成为亚利桑那州中部的地域。

20世纪，人口数量空前增长，从1955年的28亿增长到了1990年的53亿，预计在2025年前人口的数量会增长到79~91亿(恩格尔曼和勒罗伊，1993)。因而，人类在日常生活、工业和农业方面对水的需求也在急剧增加。人们的用水量不同，但是随着生活水平的提高，呈上升趋势。在美国，每人每天为维持像喝水、做饭、洗衣服这样的基本生活一般要用700公升的水，而在塞内加尔，平均每人每天的用水量为29公升。一般来说，就个人而言，每人每天100公升被认为是最小的用水量(法尔肯马克和维斯特兰德，1992)。但是，当包括农业和工业用水时，一般认为，每人每年配水量少于1,700立方米(每天约4,600公升)的国家会遭受用水压力；配水量小于1,000立方米的国家则面临着水荒(世界银行，1992)。由于水资源和人类之间存在地域上的不平衡，有预言说，在2000年，(以非洲大陆为例)12个非洲国家，拥有约25,000万人口总数，将经受严酷的缺水压力。另外，包含11亿人口或占非洲人口的三分之二的10个非洲国家在2025年之前会面临同样的缺水问题，其中的四个国家(肯尼亚、卢旺达、布隆迪和马拉维)将会面临严重的水危机。

许多国家都面临着这样的水危机，设法弄到足够让人们喝的水似乎都成了大问题，更不用说为农业、环境和工业提供充足的用水了。通常这个情况会以社会各部分的竞争性需求冲突的形式呈现出来，就像是一个关于选择的问题，比如说，生活用水、野生动植物用水和环境用水之间的选择。对自然生态系统的作用要给予更多关注，自然生态系统能控制水文循环，且具有作为主要工程工作替代品的潜力。举例来说，管理得当的河流的上游草原和森林能在盛水期减少水的流失，增加水对土壤和地下蓄水层的渗透，减少冲蚀——例如在枯水期维持水流，在盛水期减少水的流失。尤其要通过保证湿地有适当的水量供给来维持它们的功能，保护好湿地，这对人类大有裨益。很多湿地都提供重要的渔场、耕地和牧场、薪柴和药物以及野生动植物的栖息地。有些湿地也发挥着很多重要的自然水文功能，如减少洪涝，通过转移污物改善水质以及补给地下水。因而，对世界上数百万直接依赖于湿地资源或从湿地功能中获益的人们来说，为人类和环境提供水源是一回事。

当水的消耗超出了它补给的速度，水资源便会减少，无法维持人们用水需求。例如在世界上很多地区，人们抽取地下水的速度就远远超过了地下水补给的速度。在巴基斯坦的基达周围，抽取地下水的速度达到了2.5立方米每秒(m^3/s)，而水的补给速度是2.0立方米每秒，每年地下水的水

位都会下降约1米。而且，随着人口数量每年7%的增长，地下水的问题可能会恶化(即在10到11年的时间里会加倍)。在利比亚某些地区，没有现时的补给，足以支撑的使用水量为零，这样，水就被大力地开采了。在主要的生态系统被破坏的地方，就算是减少水的抽取量，使其与补给水量平衡，地下水的水位也通常会降低一个点。例如，将地下蓄水层抽出的水用来供约旦首都安曼快速增长的人口需要，这导致了阿兹别科沃洲的退化。同样地，集中使用来自西班牙中部(图表1)瓜迪亚那河的河床下的用于灌溉农业的地下水，这又导致了对Tablas de Daimiel(西班牙的一个湿地公园)的破坏，几乎完全没有办法恢复。部分问题就是，通常人们先决定需要多少水，再设法找到水源而制订计划。相比之下，首先通过对可利用的水资源的评估，然后决定怎样充分利用它，此过程可能会得到更充分的可用水资源。

在水资源管理上寻求长远的方法是有必要的，要更加强调地方性计划的完整性和对一些濒危的栖息地的保护。环境是由一系列物理、化学和生物元素构成的，包括水、氧气、植物、动物、土壤、矿物质。每一种元素都扮演着重要的角色：提供建筑材料，如岩石；或通过与其他要素相互作用，维持诸如能量资源的流动或营养循环等的重要过程。人类的影响融合于自然环境，地球上没有不受人类影响的地方。甚至从数千年前农业开始发展的时候，人类就对自然环境造成了很大程度的影响。生态系统管理方法旨在整合所有重要的物理、化学和生物元素，以及与社会、经济和公共机构因素相互作用的进程。这要求对山、干地、森林、农业、住房、工业、运输、垃圾处理、地下水层、河流、湖泊、湿地以及任何对环境有作用的因素进行统一管理。一旦专业人员确认了具有管理选择权的科学基地，当地社区、农民、工业和保护组织就需要参与进来满足不同利益集团的需要。

各种等级的机构对水的公平分配是很重要的。无论处于什么样的等级，这些机构都需要知识广博的成员，当面临水资源分配时所出现的各方面问题的时候，这些成员要有鉴别能力。训练是必不可少的，但是训练需要根据机构的不同而各有差异。专业技术顾问需要正规的训练课程，比如在水资源使用计划和湿地管理办法上的课程。同时，当地委员会代表也要进行最有效的训练，包括参与当地的活动，如参加乡村评估或通过对示范项目进行拜访。

核心词汇

cultivated ['kʌltiveitid] *adj.* 耕耘的，种植的
irrigate ['irigeit] *vt.* 灌溉
ditch [ditʃ] *n.* 沟渠
hectare ['hektɑ:] *n.* 公顷
threshold ['θreʃhəuld] *n.* 极限，门槛
mismatch ['mis'mætʃ] *n.* 配错，不匹配
headwater ['hed,wɔ:tə(r)] *n.* 上游(河源)
infiltration [,infil'treiʃən] *n.* 浸润
aquifer ['ækwifə] *n.* 含水土层(含水量足以成为井水或泉水)
pasture ['pɑ:stʃə] *n.* 牧场
groundwater [graund'wɔ:tə] *n.* 地下水
oasis [əu'eisis] *n.* 绿洲
disposal [dis'pəuzəl] *n.* 处理，处置
participatory [pɑ:'tisipeitəri] *adj.* 供人分享的

Plunging Salmon

12. 危在旦夕的野生鲑鱼

机经选粹

这一篇是关于危在旦夕的野生鲑鱼的。由于人类的活动，鲑鱼在产量、质量上都发生了很大的变化。科学家们对他们的分布、习性以及海洋环境、气候对他们的影响进行了一系列的研究。

阅读题源

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Plunging Salmon

Stocks of wild Atlantic salmon are at their lowest ever levels—and unless countries agree stringent measures to protect stocks, wild salmon will disappear from many rivers in the US and Europe, says the Worldwide Fund for Nature.

"In many countries, salmon populations are hanging on by a thread," says the WWF's Elizabeth Leighton. "Even in Scotland, where the situation is relatively healthy, there are some rivers that are seriously threatened by extinction for the first time in history."

Global wild Atlantic salmon catches have fallen by more than 80 percent between 1970 and 2000. "Salmon farming, habitat degradation and a mysterious rapid decline in sea stocks are primarily to blame," says Leighton.

Philip Smith, an expert on wild salmon at the Southampton Oceanography Centre, UK, says: "It's certainly right to say there is a serious problem, and if you look at the catch statistics, the situation looks pretty catastrophic." But, he warns: "It is impossible to generalise across rivers. For some, there are serious concerns. But others are doing okay."

WWF figures show that the populations of one third of salmon rivers in the UK are endangered. "And in the US, where salmon are left, we are counting very small numbers," says Leighton. "Even if we put big efforts into attempting to save these populations, it's questionable whether they would be successful."

Wild salmon populations are almost non-existent in much of continental Europe. "But

this is a century-old problem," says Smith. Industrial development in the 19th century polluted rivers so heavily that salmon stocks were almost eradicated.

"The decline of ocean stocks is of most concern," say both Leighton and Smith.

"Throughout the north Atlantic, stocks have declined by about 50 percent since the 1980s," says Leighton. "It is not known how much of this is down to a natural cycle in fish stocks, which does exist, or to climate change and pollution."

"The marine decline is the big mystery." Smith agrees. "Much more research is needed to understand the cause."

For wild salmon that do manage to reach rivers, salmon farms are a major threat. Sea lice thrive on closely packed farmed fish and are picked up by wild salmon. Escapees from fish farms also interbreed with, or replace, wild stocks.

Other problems include pollution from agriculture, a lack of shade-providing trees on river banks, and excess silting. But "the number one issue is aquaculture," says Leighton.

"Countries participating in the North Atlantic Salmon Conservation Organisation (NASCO) conference in Spain in early June must agree improved measures to control salmon farming," she says, "NASCO is quite influential. If the countries at the table can come up with a code to control fish farms that everyone can sign up to, that would be a strong step forward."

The UK has made major efforts to protect stocks. Salmon anglers have been issued with strict quotas on the number of fish they can kill, and measures to reduce sea catches have been introduced. "We applaud these efforts," says Leighton. But she calls for greater international co-ordination of conservation efforts.

参考译文

世界自然基金会说，大西洋野生鲑鱼的群体数量正处于有史以来的最低。除非各国同意采取严厉措施保护鱼群，否则野生鲑鱼会从美国和欧洲的很多河流中消失。

"很多国家的鲑鱼都危在旦夕，"世界野生动物基金会的伊丽莎白·莱顿说："即使是在像苏格兰这样相对健康的环境中，也有一些河流将面临有史以来鲑鱼绝种的严重威胁。"

在1970年至2000年间，全球大西洋野生鲑鱼的捕获量下降了80%以上。莱顿说："这种现象主要归咎于鲑鱼养殖和栖息地的退化以及海中鲑鱼群体数量的飞速下降。"

英国南安普敦海洋学中心野生鲑鱼方面的专家菲利普·史密斯说："现在存在很严重的问题，这种说法确实很正确。如果看看捕鱼量的统计数据，你会发现情况极其糟糕。"但他警告说："对全部河流不可能一概而论，某些河流的问题很严重，但是有些就很好。"

世界野生动物基金会的数据显示，英国三分之一生存着鲑鱼的河流都处于危险

之中。"而且我们对美国剩下的鲑鱼进行了统计，其数目很少，"莱顿说："即使我们尽最大努力去试着挽救这些鱼种，但是否能够成功还值得怀疑。"

野生鲑鱼种群几乎在欧洲大陆不复存在。史密斯说："但这是一个长达百年的问题。"19世纪工业发展严重污染了河流，导致大量的鲑鱼种群几乎被根除殆尽。

莱顿和史密斯所见略同："海洋里鲑鱼种群的减少是最值得关注的问题。"

"从20世纪80年代开始，整个北大西洋的鲑鱼种群已经下降了50%，"莱顿说："不知道这些鱼类种群的自然周期，或气候变化和环境污染实际上恶化到什么程度了。"

"海洋物种的衰落是一个大的奥秘，"史密斯同意说："我们还需要做更多的研究以了解其原因。"

对于设法到达河流的野生鲑鱼来说，鲑鱼养殖场是一个主要的威胁。海虱子在严密包装的养殖鱼上大量繁殖，后被野生鲑鱼逮住。从养鱼场逃出的鲑鱼与野生鱼群杂交繁殖或取代野生鱼群。

其他问题还包括：农业污染，河岸缺乏可遮阴的树木和河中过剩的淤泥。但莱顿说道："首要的问题是水产养殖业。"

"在西班牙参加北大西洋鲑鱼保护组织(NASCO)会议的国家在6月上旬必须同意一些改善措施，以控制鲑鱼养殖，"她说："NASCO是相当有影响力的。如果在座的国家能提出每个人都能签署的控制养殖场的法规，那将是一个强有力的进步。"

英国在保护鱼群方面做了很大的努力。鲑鱼垂钓者受到严格的配额限制。该限制规定了他们可以杀死的鱼类数量。一些以减少海上捕捞为目的的措施也相继出台。莱顿说："我们赞赏这些努力。"而且她呼吁国际之间加强保护力度方面的合作。

核心词汇

stringent ['strindʒənt] *adj.* 严厉的，严格的
measure ['meʒə] *n.* 措施
thread [θred] *n.* 线，线索
extinction [iks'tiŋkʃən] *n.* 消失，灭绝，绝种
decline [di'klain] *vi.* 下降，下跌
catastrophic [.kætə'strɔfik] *adj.* 灾难的，悲惨的
generalise ['dʒenərəlaiz] *vt.* 概括
attempt [ə'tempt] *vi.* 试图，尝试
continental [.kɔnti'nentl] *adj.* 大陆的
eradicate [i'rædikeit] *vt.* 根除，消灭
pollution [pə'lu:ʃən] *n.* 污染
thrive [θraiv] *vi.* 兴旺，繁荣
pack [pæk] *vt.* 包装
interbreed [.intə'bri:d] *vi.* 使杂种繁殖
silting ['siltiŋ] *n.* 淤泥
aquaculture ['ækwə,kʌltʃə] *n.* 水产业
farming ['fɑ:miŋ] *n.* 养殖
angler ['æŋglə] *n.* 钓鱼者
quota ['kwəutə] *n.* 限额，配额
conservation [.kɔnsə(:)'veiʃən] *n.* 保护

Sounding out the Ocean's Secrets

13. 探测海洋奥秘

机经选粹

这篇文章讲的是通过听声音来了解海洋。先说对海洋还没有月亮了解得多，因为月球表面通过光和望远镜就能观察了。然后说人们如何研究海洋的发展史，并提到了可利用超声波定位的鲸鱼。美国海军通过海底声呐系统研究海豚，研究气候和温度变化，研究降雨等等。

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Sounding out the Ocean's Secrets

Introduction

The oceans of Earth cover more than 70 percent of the planet's surface, yet, until quite recently, we knew less about their depths than we did about the surface of the Moon. Distant as it is, the Moon has been far more accessible to study because astronomers long have been able to look at its surface, first with the naked eye and then with the telescope both instruments that focus light. And, with telescopes tuned to different wavelengths of light, modern astronomers can not only analyze Earth's atmosphere but also determine the temperature and composition of the Sun or of stars many hundreds of light-years away. Until the twentieth century, however, no analogous instruments were available for the study of Earth's oceans: Light, which can travel trillions of miles through the vast vacuum of space, cannot penetrate very far in seawater.

It turns out that, for penetrating water, the phenomenon of choice is sound.

Had the world known how to harness the extraordinary ability of sound to travel through water, in 1912, the Titanic might have had some warning of the iceberg that sent the luxury liner to the bottom of the North Atlantic and took the lives of 1,522 passengers and crew. This tragic event spurred the development of tools for echolocation, or echo ranging—the technique of detecting distant objects by

sending out pulses of sound and listening for the return echo. Using these tools scientists and engineers went on to devise ever more sophisticated instruments for finding submarines during both World Wars.

Today, researchers apply their knowledge of how sound travels underwater to carry out myriad tasks, such as detecting nuclear explosions, earthquakes, and underwater volcanic eruptions. And just as astronomers use light to probe the secrets of the atmosphere, scientists in a field called acoustical oceanography use sound to study the temperature and structure of Earth's oceans measurements crucial to our ability to understand global climate change. Researchers in biological acoustics also use sound to study the behavior of marine mammals and their responses to human-generated underwater noise, helping to guide policies for protecting ocean wildlife.

All of these modern uses of underwater acoustics are founded on investigative work dating back centuries into how sound behaves in the different media of air and water. These early investigations at first had no practical application; rather, they were pursued by curious researchers interested in a basic understanding of nature. As later investigators began to build on these foundations, however, they laid the groundwork for the development of tools and techniques that have widespread applications today.

Good Vibrations

Curious investigators long have been fascinated by sound and the way it travels in water. As early as 1490, Leonardo da Vinci observed: "If you cause your ship to stop and place the head of a long tube in the water and place the outer extremity to your ear, you will hear ships at a great distance from you." In 1687, the first mathematical theory of sound propagation was published by Sir Isaac Newton in his *Philosophiae Naturalis Principia Mathematica*. Beginning in the mid-seventeenth century investigators were measuring the speed of sound in air but it was not until 1826 that Daniel Colladon, a Swiss physicist, and Charles Sturm, a French mathematician, accurately measured its speed in water. Using a long tube to listen underwater (as da Vinci had suggested), they recorded how fast the sound of a submerged bell traveled across Lake Geneva. Their result—1,435 meters (1,569 yards) per second in water of 1.8 degrees Celsius (35 degrees Fahrenheit)—was only 3 meters per second off from the speed accepted today. What these investigators demonstrated was that water—whether fresh or salt—is an excellent medium for sound, transmitting it almost five times faster than its speed in air!

But how does sound travel? Sound is a physical phenomenon, produced when an object vibrates and generates a series of pressure waves that alternately compress and decompress the molecules of the air, water, or solid that the waves travel through. These cycles of compression and rarefaction, as the decompression is called, can be described in terms of their frequency, the number of wave cycles per second, expressed in Hertz. The human voice, for example, can generate frequencies between 100 and 10,000 Hertz and the human ear can detect frequencies of 20 to 20,000 Hertz. Dogs and bats are examples

of many creatures that can hear sounds at much higher frequencies—up to 160,000 Hertz. Whales and elephants, at the other end of the spectrum, generate sounds at frequencies in the range of 15 to 35 Hertz, mostly below human hearing and thus called subsonic, or infrasonic. Sound waves, like light waves, also can be described in terms of their wavelength, the distance between the peaks of two waves; the lower the frequency, the longer the wavelength.

In 1877 and 1878, the British scientist John William Strutt, third Baron Rayleigh, published his two-volume seminal work, The Theory of Sound, often regarded as marking the beginning of the modern study of acoustics. The recipient of the Nobel Prize for Physics in 1904 for his successful isolation of the element argon, Lord Rayleigh made key discoveries in the fields of acoustics and optics that are critical to the theory of wave propagation in fluids. Among other things, Lord Rayleigh was the first to describe a sound wave as a mathematical equation (the basis of all theoretical work on acoustics) and the first to describe how small particles in the atmosphere scatter certain wavelengths of sunlight, a principle that also applies to the behavior of sound waves in water.

Navigation by Sound

Down through the ages, fishermen and seafarers had been taking advantage of the way sound travels through water and using rudimentary techniques of echolocation. In the days of the ancient Phoenicians, for example, fishermen gauged the distance to a headland concealed by fog by making a loud noise such as ringing bells and listening for the echoes. By 1902, ships passing along the American coast were warned of hidden shoals by underwater bells placed on stationary lightships. Ten years later, the Titanic tragedy motivated the Submarine Signal Company of Boston (now part of Raytheon Company) and others to begin developing more active devices that would warn of icebergs and other navigational hazards. Within a week of the tragedy, L. R. Richardson filed a patent with the British patent office for echo ranging with airborne sound, following a month later with a patent application for the underwater equivalent. The first functioning echo ranger, however, was patented in the United States in 1914 by Reginald A. Fessenden, who worked for the Submarine Signal Company. Fessenden's device was an electric oscillator that emitted a low-frequency noise and then switched to a receiver to listen for echoes; it was able to detect an iceberg underwater from 2 miles away, although it could not precisely determine its direction.

More sophisticated echo sounders were developed during World War I by the allies, but they were no match for the German U-boat menace because they could not locate and track a moving object. Shortly after the war, H. Lichte, a German scientist looking into using acoustics to clear German harbors of mines offered a theory on the bending, or refracting, of sound waves in seawater that would provide clues to solving the difficulty. Building on work by Lord Rayleigh and an earlier Dutch astronomer named Willebrord Snell, Lichte theorized in 1919 that, just as light is refracted when it passes from one medium to another, sound waves would be refracted

when they encountered slight changes in temperature, salinity, and pressure. He also suggested that ocean currents and changes in seasons would affect sound propagation. Unfortunately, Lichte was so far ahead of his time that his insights went unrecognized for almost six decades.

In the United States, efforts to develop more sophisticated echolocating devices continued between the wars under the guidance of Harvey C. Hayes of the Naval Engineering Experimental Station at Annapolis, Maryland. Hayes encouraged the U.S. Navy to play a role in civilian oceanography during peacetime, a collaboration that continues today. Thus, by the years just prior to the outbreak of World War II, U.S. naval ships were equipped with sonic depth finders as well as improved echo rangers called sonar (for sound navigation and ranging) that could pick up the noise of a submarine's propeller or an echo off a sub's hull from several thousand yards away. However, the devices were mysteriously unreliable. In the summer of 1937, officers aboard the U.S.S. Semmes were at a loss to explain or correct the ship's sonar problems during exercises in the waters off Guantánamo Bay, Cuba. For some reason, the performance of the devices consistently deteriorated in the afternoon; they sometimes failed to return echoes at all. The captain of the Semmes sought help from the Woods Hole Oceanographic Institution (WHOI) in Woods Hole, Massachusetts. Columbus Iselin, then associate director of WHOI, joined the Semmes with his laboratory's research ship Atlantis to investigate this puzzling "afternoon effect."

A Sound-Free Shadow Zone

The scientists had at their disposal a new device called a bathythermograph, or BT, invented in 1937 by Athelstan Spilhaus of WHOI and the Massachusetts Institute of Technology (MIT). The BT was a small torpedo-shaped device that held a temperature sensor and an element to detect changes in water pressure. Lowered overboard from a ship, the BT recorded pressure and temperature changes as it dropped through the water. Because the pressure in decibars is approximately equal to the depth in meters, technicians could correlate depth with temperature. Spilhaus thought his BT would have wide applications in learning many fundamentals about the ocean—the effect of temperature and depth on marine life, for instance, and the structure of ocean currents, especially the eddies along the sides of grand currents such as the Gulf Stream. But Iselin and the U.S. Navy used the BT to make a different, and more immediately useful, discovery.

The BT readings demonstrated that by early afternoon, the sun had warmed a layer of surface water 5 to 9 meters (16 to 30 feet) thick until it was about 1 to 2 degrees Celsius (2 to 4 degrees Fahrenheit) warmer than the water beneath it. Below the surface layer the water rapidly grew colder with depth. Knowing that the speed of sound increases with temperature, the scientists realized that signals from the ship's sonar would travel quickly through the warm layer and then slow dramatically when they hit the cooler layer below. They discovered that sound waves passing between layers with different properties underwent refraction bending away from the region where sound travels faster and

toward the region where its speed slows. This bending creates an acoustics "shadow zone," allowing any submarine positioned just beneath the dividing line between the warmer and cooler layers of water, to become invisible to sonar signals.

Columbus Iselin immediately recognized the significance of the acoustic shadow zone and the BT to submarine warfare. A submarine equipped with a BT could use it to determine where the shadow zone lay in relation to the pursuing ship, thus becoming nearly invisible to an enemy sonar. A sub chaser, for its part, could use a BT to opposite effect, adjusting the direction of its sonar to take into account the expected refraction.

During World War II, the BT became standard equipment on all U.S. Navy subs and vessels involved in antisubmarine warfare. Naval officers went to WHOI to learn how to use the BT, and oceanographers traveled to naval bases around the country to train battle-bound sailors. Submariners were directed to send all of their BT records to WHOI or to the University of California Division of War Research at Point Loma, where sonar charts were prepared and issued to the fleet.

Propagation of Sound in the Ocean

Once the war was over, the BT database provided a foundation for the kinds of basic ocean research Athelstan Spilhaus originally had in mind. In 1946, the Navy created the Office of Naval Research, which went on to become the premier funder of research in ocean acoustics. Scientists now resumed their investigations of the conditions that affect the propagation of an underwater sound signal.

A number of factors influence how far sound travels underwater and how long it lasts. For one, particles in seawater can reflect, scatter, and absorb certain frequencies of sound just as certain wavelengths of light may be reflected, scattered, and absorbed by specific types of particles in the atmosphere. Seawater absorbs 30 times the amount of sound absorbed by distilled water, with specific chemicals (such as magnesium sulfate and boric acid) damping out certain frequencies of sound. Researchers also learned that low-frequency sounds, whose long wavelengths generally pass over tiny particles, tend to travel farther without loss through absorption or scattering.

Further work on the effects of salinity, temperature, and pressure on the speed of sound underwater has yielded fascinating insights into the structure of the ocean. Speaking generally, the ocean is divided into horizontal layers in which sound speed is influenced more greatly by temperature in the upper regions and by pressure in the lower depths. At the surface is a sun-warmed upper layer, the actual temperature and thickness of which varies with the season. At midlatitudes, this layer tends to be isothermal, that is, the temperature tends to be uniform throughout the layer because the water is well mixed by the action of waves, winds, and convection currents; a sound signal moving down through this layer tends to travel at an almost constant speed. Next comes a transitional layer called the thermocline, in which temperature drops steadily with depth; as temperature falls, so does the speed of sound. However, at a point

roughly 600 meters to 1 kilometer (0.4 to 0.6 miles) below the surface, further changes in temperature are slight (the water the rest of the way to the bottom is effectively isothermal). Now the dominant factor influencing the speed of sound is the increasing pressure, which causes sound to speed up.

A Sound Pipeline

In 1943, Maurice Ewing and J. L. Worzel at Columbia University conducted an experiment to test a theory Ewing had proposed a few years earlier. Ewing theorized that low-frequency waves, which are less vulnerable than higher frequencies to scattering and absorption, should be able to travel great distances, if the sound source is placed correctly. The researchers set off an underwater explosion of 1 pound of TNT in the Bahamas—and learned that it was detected easily by receivers 3,200 kilometers (2,000 miles) away on the coast of West Africa. In analyzing the results of this test, they discovered a kind of sound pipeline, which they called the sound fixing and ranging, or SOFAR, channel. Also known as the "deep sound channel," this pipeline was discovered independently by Russian acoustician Leonid Brekhovskikh of the Lebedev Physics Institute, who analyzed the signals received from underwater explosions in the Sea of Japan.

The scientists had found that, because of the laws of refraction, sound waves can be trapped effectively in a narrow channel that straddled a region of minimum speed where the bottom of the thermocline met the top of the deep isothermic layer. As shown in the illustration, a sound wave traveling obliquely through the thermocline will bend downward as the speed of sound decreases, and then bend upward when increasing pressure causes sound to speed up—only to bend downward again toward the depth of minimum speed as warming temperatures cause sound velocity to increase. Sound introduced into this sound channel thus could travel thousands of miles horizontally with minimal loss of signal. The deep sound channel occurs at a depth that varies with ocean temperature; in the polar regions, for example, where the colder surface temperature brings the thermocline nearer to the surface, the deep sound channel approaches the surface as well.

The U.S. Navy was quick to appreciate the usefulness of low-frequency sound and the deep sound channel in extending the range at which it could detect submarines. In great secrecy during the 1950s, the Navy launched a project that went by the code name Jezebel; it would later come to be known as the Sound Surveillance System (SOSUS). The system involved arrays of underwater microphones, called hydrophones, that were placed on the ocean bottom and connected by cables to onshore processing centers. With SOSUS deployed in both deep and shallow waters along both coasts of North America and the British West Indies, the U.S. Navy not only could detect submarines in much of the northern hemisphere, it also could distinguish how many propellers a submarine had, whether it was conventional or nuclear, and sometimes even the class of sub.

Listening to the Ocean

With the end of the Cold War, the U.S. Navy permitted civilian scientists to use

SOSUS for basic research, giving them access to information they could not get otherwise. Scientists now could apply underwater acoustics to learning more about the geology and biology of the ocean's murky depths. In 1990, Christopher Fox and his colleagues from the Pacific Marine Environmental Laboratory were part of the military's initial evaluation of this dual civilian-military use for SOSUS. Since 1991, Fox's team, working on VENTS, the Study of Hydrothermal Venting Systems, has been using SOSUS to pinpoint the location of underwater volcanic eruptions. This has given scientists a better picture of the events that occur along mid-ocean ridges the mountain-like elevations where the ocean floor actually is being created from molten rock pushing up from below Earth's crust. (For more information on seafloor spreading, see *the Beyond Discovery* article "When the Earth Moves: Seafloor Spreading and Plate Tectonics.")

When Fox and his colleagues listened to the recordings of the underwater eruptions they also heard other underwater noises—including the vocalizations of baleen whales. The realization that SOSUS could be used to listen to whales also was made by Christopher Clark, a biological acoustician at Cornell University, when he first visited a SOSUS station in 1992. When Clark looked at the graphic representations of sound, scrolling 24 hours day, every day, he saw the voice patterns of blue, finback, minke, and humpback whales. He also could hear the sounds. Using a SOSUS receiver in the West Indies he could hear whales that were 1,770 kilometers (1,100 miles) away.

Whales are the biggest of Earth's creatures. The blue whale, for example, can be 100 feet long and weigh as many tons. Yet these animals also are remarkably elusive. Scientists wishing to observe blue whales firsthand must simply wait in their ships for the whales to surface. A few whales have been tracked briefly in the wild this way but not for very great distances, and much about them remains unknown. Using the SOSUS stations, scientists can track the whales in real time, positioning them on a map. Moreover, they can track not just one whale at a time, but many creatures simultaneously throughout the North Atlantic and the eastern North Pacific. They also can learn to distinguish whale calls. For example, Fox and colleagues have detected changes in the calls of finback whales during different seasons and have found that blue whales in different regions of the Pacific ocean have different calls.

One of the most intriguing mysteries about whales is how they find their way across such vast distances. Christopher Clark is interested in whether whales, like dolphins and bats, echolocate. Rather than bounce sound off objects a few yards away, however, whales send their sound pinging off geologic structures hundreds of miles away. The theory that whales use their own sound to get their bearings has been around for some time; now the data from SOSUS tracking give Clark some compelling circumstantial evidence to support it. When he superimposed the SOSUS-made track of a whale on a map of the ocean floor, it looked as though the whale was slaloming from one underwater mountain to another, with these seamounts being hundreds of miles apart. He did a



similar matchup with other whales and got the same results. Clark hypothesizes that whales use sound not just to communicate, but to navigate, that is, they map the ocean acoustically to find their way around in it.

Probing the Ocean Interior with Sound

SOSUS, with its vast reach, also has proved instrumental in obtaining information crucial to our understanding of Earth's weather and climate. Specifically, the system has enabled researchers to begin making ocean temperature measurements on a global scale, measurements that are key to puzzling out the workings of heat transfer between the ocean and the atmosphere. The ocean plays an enormous role in determining air temperature—the heat capacity in only the upper few meters of ocean is thought to be equal to all of the heat in the entire atmosphere.

Given increasing evidence of global warming, scientists around the world are struggling to determine how much of the observed warming trend is simply part of the natural climate cycle and how much has been caused by the burning of fossil fuels and other human activity. Current numerical models that simulate the global climate and predict climate change are hampered by insufficient temperature measurements in many areas of the globe, and especially below the ocean surface.

In 1978, Walter Munk of the Scripps Institution of Oceanography and Carl Wunsch of MIT suggested using the methodology of computer-aided tomography—the CAT scan to study and monitor the ocean over distances of about 1,000 kilometers (600 miles). A medical CAT scan constructs a three-dimensional image by combining information from many different x-rays taken at different angles. The oceanic equivalent of a CAT scan—ocean acoustic tomography—would combine information from low-frequency sound instead of x-rays.

For sound waves traveling horizontally in the ocean, speed is largely a function of temperature. Thus, the travel time of a wave of sound between two points is a sensitive indicator of the average temperature along its path. Transmitting sound in numerous directions through the deep sound channel can give scientists measurements spanning vast areas of the globe. Thousands of sound paths in the ocean could be pieced together into a map of global ocean temperatures, and by repeating measurements along the same paths over time, scientists could track changes in temperature over months or years.

In 1983, John Spiesberger, now at Pennsylvania State University, and Kurt Metzger at the University of Michigan supplied the first experimental verification that tomography was possible across an entire ocean basin—much farther than Munk and Wunsch had proposed. Spiesberger and Metzger sent sound pulses 4,000 kilometers (2,300 miles) from a source on the seafloor off Oahu, Hawaii, to nine of the Navy's SOSUS listening arrays in the northeast Pacific. By repeating the experiment in 1987 and 1989, Spiesberger and Metzger demonstrated for the first time that extremely slight changes in acoustic travel time across an ocean basin reflect changes in water temperature along the sound path. A decrease of two-tenths of a second in travel time in this experiment was

about equal to an average temperature rise of one-tenth of a degree Celsius.

In 1989, Munk and Andrew Forbes of the Commonwealth Scientific and Industrial Organization in Australia suggested transmitting sound globally on a regular basis for a decade to try to monitor climate change. To determine whether the signal would be stable enough to obtain measurements across half the globe, they placed a sound transmitter near Heard Island, an uninhabited Australian island in the southern Indian Ocean, with receivers in all oceans but the Arctic. For five days in January 1991, scientists from nine nations, led by the United States, transmitted sound from a ship off Heard Island. Sixteen listening sites picked up the signals in the deep sound channel from as far away as 18,000 kilometers (11,000 miles). Although sound was detected at great distances, insufficient resolution was achieved in this experiment to measure temperature changes reliably at large distances.

Building on lessons learned in the previous experiments, the Acoustic Thermometry of Ocean Climate (ATOC) project involving scientists from 13 countries was launched in 1992. A key objective is to establish baseline ocean temperatures in the Pacific against which changes can be measured. Because of concern about the effects that the sounds might have on marine mammals, the ATOC transmissions were delayed until 1996. However, in April 1994, a team of U.S. and Russian scientists led by Peter Mikhalevsky at Science Applications International Corporation transmitted sound across the Arctic Ocean and made a startling discovery. This Transarctic Acoustic Propagation (TAP) experiment not only proved the feasibility of long-range acoustic thermometry in the ice-covered Arctic, but the travel-time measurements revealed an average warming of approximately 0.4 degree Celsius, when compared to historical temperature measurements, at the mid-depths of the Arctic Ocean along the propagation path. Extensive measurements by submarines and ice-breakers have subsequently documented this pervasive temperature change in the Arctic Ocean, which is now the focus of intensive new research. The TAP experiment launched the joint U.S. and Russian Arctic Climate Observations using Underwater Sound (ACOUS from the Greek, akouz, meaning "listen!") program in 1995. Although the pioneering ATOC program will end in 1999, ACOUS and other acoustic monitoring programs are continuing.

Researchers also are using other acoustic techniques to monitor climate. Oceanographer Jeff Nystuen at the University of Washington, for example, has explored the use of sound to measure rainfall over the ocean. Monitoring changing global rainfall patterns undoubtedly will contribute to understanding major climate change as well as the weather phenomenon known as El Niño. Since 1985, Nystuen has used hydrophones to listen to rain over the ocean, acoustically measuring not only the rainfall rate but also the rainfall type, ranging from drizzle to thunderstorms. By using the sound of rain underwater as a "natural" rain gauge, the measurement of rainfall over the oceans will become available to climatologists.

In the centuries since Leonardo da Vinci's



inspired suggestion for listening to ships underwater, many researchers have contributed to the development of techniques that take advantage of the way sound travels through water. From military uses such as submarine warfare and detecting underwater explosions to scientific endeavors such as monitoring climate change and studying ocean wildlife, we have seen how modern society benefits from the investigations of those who pursued the answers to basic questions of the workings of nature.

参考译文

简介

地球上海洋面积占地球表面的70%，但是直到最近，我们对这些海洋深度的了解仍然比对月球表面的了解还要少。尽管距离如此之远，对月球的研究也已经变得易如反掌了，因为天文学家们长期以来都能看到它的表面，首先用裸眼看，进而用聚焦光源的天文望远镜。而且，利用可以观察不同波长的望远镜，现代的天文学家们不仅能分析地球的大气层，还能测定数百光年远的太阳或恒星的温度和结构。然而，直到20世纪，都还没有出现能用来研究地球上海洋的类似的工具。能穿越浩瀚的真空空间的光，却不能在海水中穿越。

事实表明，要穿透水域，最佳的选择就是声波了。

好奇的研究者们长期以来都对声波及其在水中的传送方式很着迷。早在1490年，里奥那多·达·芬奇观察到："如果把船停下，将长软管的一端置入水中，将另一端贴近耳朵，你会听到在遥远距离之外航行的船的声音。"1687年，艾萨克·牛顿爵士在其所著的《自然哲学之数学原理》中发表了第一个声传播数学理论。在17世纪中期，研究者们就开始测量声音在空气中的传播速度，但是直到1826年，瑞士物理学家丹尼尔·克拉顿和法国数学家查尔斯·斯特姆才准确地测量出声音在水中的传播速度。借助一根软管听水下的声音(就像达·芬奇建议的那样)，他们记录了穿越日内瓦湖水中的铃声的传播速度。他们得到的结果仅比现在公认的速度差3米/秒。即在1.8摄氏度的水中(华氏35度)速度为1,435米(1,569码)每秒。这些研究者的发现表明：无论是淡水还是咸水，水都是声音传播的优质媒介，声音在水中的传播速度是它在空气中传播速度的5倍！

科学家们发现，由于折射定律，声波能在跨过斜温层层底和深层等温层顶交接处声速最低的区域的一条细细的通道中被有效地捕捉到。就像图中展示的那样，一个斜着穿过斜温层的声波转弯抹角地会随着声音速度的降低而向下弯曲，然后再根据不断增加的压力引发的声音速度的加快而向上弯曲，只在温度变暖而使声速增加时，才再次向下弯曲到声速最低的深度。如此一来，被引入到这个声音通道中的声音便能以最小限度的信息流失水平传播数千英里。这个设立在深处的通道根据海洋的温度不同而有不同的深度。例如，在极地地区，更寒冷的表面温度将斜温层带到更贴近海洋的表面，深层声音通道也更接近海洋表面。

随着冷战的结束，美国海军允许平民科学家使用声音监视系统来进行基本的研究，并为他们提供了在别处不能获得的信息。科学家们现在能引用水中声学来更多地了解昏暗的海洋深处的地质概况和海底生物。1990年，太平洋海洋环境实验室的

克里斯托佛·弗克斯及其同事也是第一批将声音监视系统的应用从军事方面演变为民用—军事两用的一部分人员。从1991年起，研究VENTS热液通风系统的弗克斯的小组一直都在用声音监视系统测定海底火山爆发的位置，这为科学家们对发生在沿着中海脊——像山一样隆起的地方，在那里洋底实际上正被从地壳下面推起的熔岩不断塑造着——发生的事件提供了一个火山爆发时的更清晰图解。(关于海底扩张的更多信息，参见《超越发现》中“永不停歇的地球：海底扩张和板块构造”。)

鲸最吸引人的神奇处之一在于它们穿越这么远的距离时是怎样识路的。克里斯托佛·克拉克对鲸是否像海豚和蝙蝠那样对回波定位很感兴趣，然而鲸不是向几码外的物体上发射声音，而是向几百海里外的地质结构发出声音。鲸用它们自己的声音获知方位的理论已存在有一段时间了。现在，来自声音监视系统跟踪的数据给克拉克提供了令人信服的间接证据。当他把声音监视系统制作的一条鲸的踪迹叠加在一幅海底地图上时，看起来鲸好像正在从一座海底山越过障碍到另一座山，这些海山之间相隔几百海里远。他用其他鲸作了类似的匹配，得到了相同的结果。克拉克猜测鲸不仅用声音交流，还用它导航，也就是说，它们用声音绘制海图并在其中找到路径。

研究人员也使用其他的声学技术来监测天气变化。例如，华盛顿大学的海洋学家维夫·尼斯特恩对测量海洋的降雨量中声音的使用进行了探索。毋庸置疑，监测全球降雨模式的变化有助于了解主要的气候变化和众所周知的厄尔尼诺现象。自1985年，尼斯特恩就开始利用水听器监测海洋的降雨量，通过声音不仅测量到了降雨量，还测出了从毛毛细雨到大雷雨的降雨类型。将水中的雨声作为一个“自然的”雨计量器，气候学家便能通过它来测量海洋表面的降雨量。

从达·芬奇启发人们从水下听船的声音的那些世纪以来，许多研究者为利用声音在水中传播方式的技术发展作出了贡献。从潜水艇战和探测水下爆炸物这类军事应用到气候变化的监测和海洋生物的研究这些科学性的尝试，我们已经看到了现代社会是怎样从那些追寻自然运作方式基本问题答案的研究中获得益处的。

核心词汇

composition [kɔmpə'ziʃən] *n.* 结构，组织
extremity [iks'tremiti] *n.* 端点，极点
propagation [ˌprɔpə'geiʃən] *n.* 增殖，繁殖
mathematician [ˌmæθimə'tiʃən] *n.* 数学家
thermocline ['θə:məˌklain] *n.* 斜温层
isothermic [ˌaisəu'θə:mik] *adj.* 等温的
obliquely [ə'bli:kli] *adv.* 倾斜地
minimal ['miniməl] *adj.* 最低限度的，最小的
geology [dʒi'ɔlədʒi] *n.* 地质学
pinpoint ['pinˌpɔint] *vt.* 精确地找到，准确的确定
volcanic [vɔl'kænik] *adj.* 火山的
molten ['məultən] *adj.* 熔化的，炽热的
intriguing [in'tri:giŋ] *adj.* 吸引人的，有趣的
echolocate ['ekələkeit] *vt.* 凭回声(或回波)测定……的方向(或位置)
superimpose ['sju:pərim'pəuz] *vt.* 重叠(安装，添加)
slalom ['sleiləm] *n.* 障碍滑雪比赛
matchup ['mætʃˌʌp] *n.* 匹配
acoustically [ə'ku:stik(ə)li] *adv.* 听觉上，声学上
hydrophone ['haidrəfəun] *n.* 水中听音器
climatologist [ˌklaimə'tɔlədʒist] *n.* 气候学家

Human Implications of Climate Change in the Canadian Arctic

14. 加拿大北极地区气候变化给人类的暗示

机经选粹

这一篇是关于气候对因纽特人的影响。通过对因纽特人的研究能知晓北极的环境状况。

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Human Implications of Climate Change in the Canadian Arctic

It is now widely accepted that the evidence of climate change at high latitudes is overwhelming *(Comiso, 2003)*. These changes are posing significant risks and hazards to communities throughout the circumpolar north *(Ford and Smit, 2004)*. Models predict that future climate change and its effects will be felt earliest and strongest in the Arctic *(Holland and Bitz, 2003)*. As a consequence, climate-related risks, which already pose challenges to Arctic communities, are expected to increase. While there is general agreement that indigenous peoples in the North are being affected by climate change and that future changes in climate are likely to pose serious challenges, the nature of these risks is poorly understood *(Ford and Smit, 2004)*. This paper presents a vulnerability based approach to characterize the human implications of climate change for Arctic communities. The approach is applied to

the Inuit community of Arctic Bay, Nunavut, to characterize vulnerability to changing climatic conditions.

Much of the information on the implications of climate change for communities in the Arctic is in the form of broad studies conducted by the government and the IPCC (Anisimov and Fitzharris, 2001), and from specific studies of the implications of changes in certain biophysical systems (Nelson et al., 2002).

These studies have largely been preoccupied with predicting how certain biophysical systems will respond to climate change. While this research has served to increase our knowledge of how climate change will affect biophysical processes, our current level of knowledge about its implications for human activity remains limited (Duerden, 2004). The consequences of a shift in climate for humans are not calculable from the physical dimensions of the shift alone; they require attention to human dimensions through which they are experienced. Changes in physical environments are problematic to the extent that they exceed the ability of people to manage them.

Much of the work focuses on climate change in isolation from other conditions which influence the implications of climate change. How people experience, respond to, and cope with environmental phenomena, however, occurs in a context of social, cultural, economic, and political conditions and processes. In the Arctic, changes in livelihoods in the later half of the twentieth century have been profound *(Fenge, 2001)*, and have stressed many of the traditional mechanisms by which communities manage climatic conditions. These are predicted to continue and further alter Inuit livelihoods *(Fenge, 2001)*. Nuttall *(2001, 27)* likens this to a "double exposure" where people will be confronted both by climate change and by the consequences of social change.

There has been limited research which has explicitly incorporated community perspectives on the human implications of climate change. For Arctic communities, risks are often associated with harvesting and livelihoods. Identification of these conditions and how they are managed requires documentation of conditions that are relevant to people and the management strategies they employ.

In the climate change field, the vulnerability approach has evolved to address these needs; the approach focuses on community relevant vulnerabilities and the processes through which change is managed in the context of livelihood assets, constraints, and outside influences. It starts with an assessment of the vulnerability of the community, in terms of who and what are vulnerable, to what stresses, in what way, and what capacity exists to adapt to changing risks (Ford and Smit, 2004).

Arctic Bay is a coastal Inuit community of 646 people, 93% Inuit, located on north Baffin Island, Nunavut, Canada. The settlement has expanded dramatically since the 1960s and the economy has shifted from one based entirely on subsistence

to a mixed economy where both waged labor and harvesting activities assume an important role. Hunting underpins the social, cultural and economic fabric of the community and contributes significantly to the food supply *(DSD, 2002)*. During spring 2004, 65 semi-structured interviews were conducted with a cross section of community members. A purposeful sampling strategy was employed to ensure that all social groups in the community were represented. The interviews were complemented with experiential trips on the land and informal meetings with key informants.

A combination of changing climatic conditions, superimposed on changes in harvesting behavior, have increased the exposure of the community to climate related risks.

The use of snowmobile requires knowledge of where the safe and unsafe ice is located, because, unlike dog teams, snowmobiles cannot locate dangerous ice. This has not traditionally been a problem; due to personal observation, experience, and knowledge passed on by elders and shared between friends and family, hunters know the location of dangerous ice and times of the year to be careful. It is only with increasingly unpredictable ice conditions that the risks associated with snowmobile travel have fully emerged. This is reflected in the increasing loss of equipment while harvesting in recent years. (MacDonald, pers.comm.)

Subsistence activities require substantial monetary investments (Chabot, 2003) and have resulted in an increased dependence on monetary resources. Initially hunters supported themselves almost exclusively from hunting and trapping, trading skins and furs for equipment. Increased prices, however, combined with the declining markets in Europe for seal skins (Wenzel, 1991; Barnabas pers.comm.) resulted in harvesters seeking to secure an income from different sources to support their harvesting activities, including the commercial exploitation of narwhal for the tuskivory. Around the same time, externally imposed quotas on narwhal limited the catch of this commercially important species. As a result of these two trends, the increasing importance of monetary resources in harvesting and the imposition of quotas on narwhal, hunters have attempted maximize their chance of catching narwhal before the quota expires by hunting at the floe edge during break-up. Traditionally, hunters would have avoided this time, waiting for the narwhal to migrate closer to the community and for the ice to retreat (Brody, 1976). The floe edge is a highly unstable environment and break-up is the most dangerous time to be on the ice. As expressed by Theo Ikkumaq, this exposes harvesters to the potential for being stranded on drifting ice.

"It's breaking off when they are hunting! That is why they get stranded."

The dangers of hunting at the floe edge are well known, and hunters manage the risks using their experience and knowledge to identify precursors to hazardous conditions;

a south wind, for example, is avoided. With the increasing unpredictability of the wind, However, accurately recognitions of the precursors is increasingly problematic. In 2000, 52 hunters were stranded when the wind suddenly shifted, causing the floe edge ice to detach from the landfast ice and drift out (George, 2000).

The community of Arctic Bay is managing these risks in numerous ways. Hunters are making additional preparations before going out in response to the increasing risk of getting stranded due to unforeseen conditions. Many are taking extra food, gas, and supplies, and in preparation for summer boating are identifying safe areas where they can get shelter. Other responses seek to reduce the likelihood that dangerous conditions will be encountered while out on the land. Hunters are becoming more risk averse, avoiding traveling on the land or water if they have reason to believe the weather is going to be bad, avoiding dangerous areas, avoiding traveling at dangerous times of the year, returning quickly if out on the land when weather conditions turn, and generally being more vigilant when engaged in day to day activities. Indeed, some have stopped taking part in the floe edge narwhal hunt altogether. Technological adjustments are being undertaken, and include the use of GPS when hunting at the floe edge to detect if the ice is moving, the more widespread use of vhf radio even on short trips, and the consultation of satellite images provided in the Hamlet Office prior to travel on the ice. Equipment used has also been modified; more powerful outboard boat engines to allow for shorter time spent on exposed water are being used and hunters are taking along small row boats to safeguard against the risks of getting stranded on drifting ice. Losses associated with lost equipment are sometimes shared between family and friends. This usually involves the lending of equipment or the re-allocation of money in the household unit to purchase new equipment.

These strategies by which increased exposure have been managed are largely behavioral and have been autonomously undertaken by individuals in response to changes that are being experienced and in anticipation of future change. Responsibility for these strategies largely rests with the more experienced hunters and elders who encounter changing climatic conditions and respond to them by being out on the land frequently and adapting through trail and error experience. This knowledge is transferred through informal channels; young or inexperienced hunters usually travel with or seek advice form these "local experts" before going out, and the knowledge will be communicated in person. This information is also communicated over the radio and will be discussed between friends and family. Technological adjustments have also been utilized, the responsibility for which lies, in many instances, with younger Inuit who introduce the technology and demonstrate how it used.

Adaptations are manifestations of a systems adaptive capacity, and the ability of the



community of Arctic Bay to manage the climatic risks is indicative of the community's resilience. The adaptive capacity of the community is facilitated by traditional skills and extensive knowledge of the environment, strong social networks, and flexibility in seasonal hunting cycles. These characteristics of Inuit society have enabled Inuit to live and thrive in the Arctic for millennia (Sabo, 1991; McGhee, 1996), and are influenced by broader socio-economic and political conditions and processes (as will be evaluated in the next section).

Environmental circumstances change from one trip to another and unpredictability and change defines the very nature of Arctic hunting (Wenzel, 1991). Inuit Quajimajatunganit (IQ), traditional Inuit knowledge and a code of behavior based on time-honored values and practices, has evolved to manage unpredictability and variability. Survival in the harsh Arctic environment has depended on this (Robards and Alessa, 2004). Competence on the land and in the skills necessary for safe and successful hunting are a highly valued aspect of IQ and are nurtured from a young age. Through experience of being on the land, from knowledge passed on by elders and communication with others, hunters know the dangers of hunting and will take precautions; they know precursors to certain hazardous conditions, will not take unnecessary risks, know how to survive if they are caught in bad weather, and, especially for the more experienced hunters, they know how to navigate using traditional means if they are caught out in bad weather (MacDonald 2004). The body of knowledge embodied in IQ goes beyond what is essential for success and includes significant redundancy; hunters learn from a young age to take along survival equipment even on short trips and to prepare above and beyond what is necessary. When faced with an emergency situation this redundancy is drawn upon to ensure survival; if stranded by bad weather, for example, the extra food, naphtha, and warm clothes that hunters take along guarantees their safety.

IQ is dynamic, continually evolving and being updated and revised in light of observations, trial and error experience, and the incorporation of non-traditional knowledge alongside the traditional (Fast and Berkes, 1999). Through first hand experience of chancing climatic conditions, and from communication with others, the knowledge embodied in IQ has adapted to changing climatic conditions. As expressed by Tagoonak Qavavauq, the fact that the weather is no longer predicable by traditional means, that the weather may suddenly change, or the precursors to certain hazardous conditions are no longer apparent, is the new 'norm' and individuals prepare accordingly.

"I think the hunters now are more aware of changing conditions,so they are preparing."

The propensity of Arctic environments to undergo fluctuations that are unpredictable

has created incentives for individuals to master a diversity of hunting and fishing skills and procurement activities (Berkes and Jolly, 2002), harvesting what is available when it is available and where it is available. Hunting as practiced is in many ways opportunistic; hunters may set out to hunt caribou in August and September when the meat and fur is good, but if they are hard to find or numbers low then other species will be harvested. This not only allows people to cope with variations in animal numbers but also enables them to manage variations in environmental conditions; if the freeze-up is late then hunters will extend fishing season and wait until it freezes to resume normal activity; if certain areas are not accessible due to limited snow cover for snowmobile travel then people will go to different locations.

Social networks, the norms and networks that enable people to act collectively (Woolcock and Narayan, 2000), facilitate the sharing of information, the sharing of losses, and the sharing of food, providing security in the context of pervasive and unpredictable environmental changes (Robards and Alessa, 2004). While the complex networks of sharing described by Boas (1888) and Damas (1963) can no longer be discerned, the "economy of sharing" as Wenzel (1991) describes it, remains central to Inuit livelihoods (Chabot, 2003). The sharing of country food, in particular, underpins Inuit cultural identity and is still considered obligatory, occurring between friends, family, and at certain times of the year to anyone in the community. The sharing of equipment such as GPS, radios, and other safety equipment is widespread and allows for safe travel on the land (DSD, 2002). Social networks also provide mechanisms for the rapid and effective community dissemination of information on dangerous conditions. After returning from a good hunting ground, experiencing dangerous conditions, or noticing thin ice, these personal observations will be passed on to others in the community.

In addition, institutional support underpins adaptability. In light of changing exposure, investment in GPS, vhf radios, more powerful boat engines, and safety equipment, are required for safe and successful hunting. This requires significant capital outlay. Further, individuals who lose equipment in hunting accidents have to replace lost machinery. This places significant burden upon Northern indigenous communities which have limited employment opportunities and high rates of unemployment. Well developed institutional support in the form of federal government monetary transfers, and emerging institutional support from the Nunavut Government and Lands Claim institutions, plays an important role both in facilitating the ability of people to engage in hunting and in covering the purchase of new equipment necessary to cope with the changing conditions. Nunavut Tunngavik's Hunter Support Program, in particular, has facilitated the purchase of machinery.

The research demonstrates that a combination of changing climatic conditions, superimposed on changes in harvesting behavior, have increased the exposure of

the community to climate related risks. In the face of changing climatic conditions the residents of Arctic Bay have demonstrated significant adaptability. The coping strategies that have been employed are similar to those used by Inuit communities elsewhere in the Arctic *(Berkes and Jolly, 2002)*, and include modification of the timing and location of harvesting activities; sharing of losses; changing how hunting is done; avoiding dangerous areas; making extra preparations before going out; and sharing food, information, and equipment. The ability to cope is facilitated by characteristics of Inuit society that have underpinned Inuit survival in the unpredictable Arctic environment: traditional skills and extensive local knowledge, flexibility in harvesting, and strong social networks. In addition, institutional support has increasingly played an important role in the later half of the twentieth century. There are, however, emerging vulnerabilities; in recently years there has been a dramatic increase in the number of people getting into trouble on the land and needing to be rescued. Changing climatic conditions are in part responsible; the environment is more variable and less predictable today. The increase in vulnerability, however, comes not so much from changing climatic conditions but from challenges posed by social, cultural and economic changes which have transformed Inuit livelihoods. These have served to modify those attributes of Inuit society which have facilitated adaptive capacity. There has been a gradual erosion of traditional skills which are vital for safe travel on the land, a dilution of traditional sharing networks which help in the pooling of risk and the allocation of resources, and an increasing dependence on outside support. In particular, younger generations and inexperienced Inuit who go on the land alone, or without more experienced people, are at risk.

The research indicates that the ability to manage future climatic changes will depend on social, cultural, economic, and political processes and conditions which affect how Inuit interact with the environment. Changes in these conditions will constrain or enhance the ability to cope with future climate change.

参考译文

如今，人们普遍认为，高纬度地区的气候变化巨大的。这些变化对整个北极地区的人民造成了不可忽视的威胁。根据这些变化形势可以预言，北极地区将会最早也最强烈地感受到未来的气候变化及其影响。因此，气候造成的威胁，已经对北极居民带来了挑战，人们预计这些威胁还会增强。北极的土著居民正在遭受气候变化所带来的影响，未来的气候变化很有可能带来严重的挑战，尽管这一点人们普遍认同，但是人们对这些危险的本质还理解得很少。这篇文章展示了一个方法，虽然这个方法不是很完善，但是此方法将气候变化给北极居民带来的暗示变得明显。这个方法适用于北极湾的因纽特区、努勒维特地区，

它显示出气候变化条件的脆弱特性。

大部分的工作重点强调的是与那些影响气候变化含义的其他条件所不符的气候变化。然而，人们如何经历、做出反应和处理环境问题，都产生于社会、文化、经济和政治形势和进程的背景下。在北极地区，在二十世纪的后半期里，人们的生活一直都发生着深刻的变化，并且这些变化都突出了许多人们用来控制天气情况的传统机械装置。这些机械，预计用来继续和进一步改善因纽特人的生活。纳托尔将其比作是一个“双重暴露”，在那里，人们将遭受气候变化和社会变化的双重影响。

北极湾是一个沿海的因纽特区，坐落于加拿大努勒维特地区巴芬岛北部，人口总数646，其中93%是因纽特人。自从20世纪60年代以来，此居住地开始急剧扩张，经济形势从单一的、完全依靠物质条件的经济体转变为复合经济体。在复合经济中，工人阶级和农民阶级都发挥了重要作用。狩猎支撑着公众的社会、文化和经济的基础结构，并对食物供应作出了巨大贡献。在2004年春季，对社区成员交叉式的展开了65轮半结构化的访谈。运用了有目的的筛选策略来保证他们能够代表社区的所有社区群体。这些访谈还配有非正式会议，这些会议是关于陆地上有丰富经验的旅行和主要报告人的。

变化的气候环境和人们收获方式的变化相结合，增加了人们暴露在与气候相关的危险之下的风险。

北极湾的居民正在通过各种方式处理这些威胁。猎人正在为外出做额外的准备，避免陷入由不可预知的环境条件带来的日益增加的风险。许多猎人带上了额外的食物、可燃气和供应品。为夏天划船所做的准备就是要确定能够借以蔽身的安全区域。为了降低外出时在陆地遭遇危险环境的可能性，人们也有其他的一些应对措施。如果猎人们确信天气将会变得糟糕的话，那么他们将变得越来越有能力抵制危险，避免在陆地和水里旅行，避免危险区域，避免在一年中的危险时间旅行。当外出在陆地上的时候，一旦天气情况变化，他们能够迅速返回；当从事日常活动时，一般来说他们都会更加警惕。确实，一些人已经不再在大浮冰的边缘狩猎独角鲸了。人们正在使用技术调节装置，例如：在大浮冰的边缘狩猎时，使用GPS系统来检测冰块是否在移动；还有，人们即使在短期旅行中也会广泛使用超高频率的无线电接收装置；以及在冰上旅行之前，会咨询哈姆雷特办公室提供的卫星图像。所使用的装备也已经被更换了；人们正在使用更强有力的外侧船引擎，这个引擎使在水面暴露的时间缩短，猎人正在使用成排的小船减少在漂流的冰上搁浅的风险。有时，对丢失的装备所带来的损失，家人和朋友会共同承担。通常，这包括装备的外借或者家庭中的钱又被分配用来购买新装备。

研究证明，变化的气候环境和人们收获方式的变化相结合，增加了该地区居民暴露在与气候相关的危险之下的风险。面对变化的气候条件，北极湾的居民已经显示出对他们来说非常重要的适应能力。业已被采用的解决策略与北极地区其他地方的因纽特人使用的策略相似，包括：改变收获活动的时间和地点，分担损失，改变狩猎的方式，避免进入危险区域，在外出之前做额外的准备，与他人分享食物、信息和设备。传统的技巧和广泛的本地知识、收获的灵活性、强大的社会结构这些特点，在不可预知的北极环境下，加固了因纽特人生存的基础，也提高了因纽特人的适应能力。另外，在二十世纪的后半期，公共机构的支持发挥着越来越重要的作用。然而，却越来越显示出一些不尽如人意的地方；近些年，在陆地上陷入困境，需要被解救的人群的数量已经急剧增加。有一部分是与变化的气



候环境相关的；当今，环境更加变化多端和不可预知。然而，正不断增多的缺点没有多少是来自于天气状况的变化，更多的是来自于社会、文化、经济的变化所带来的挑战，这些变化已经改变了因纽特人的生活。这些改变了因纽特社会的一些特性，使人们提高了适应能力。人们的传统技巧也已经逐渐衰落，而这些传统技巧对在陆地上的安全旅行是很重要的，传统的相互分享的网络系统有助于将风险与资源的分配以及人们对外部援助日益增长的依赖性结合起来。尤其值得注意的是，更为年轻的几代人和独自登陆的、没有经验的，或没有太多经验的因纽特人，都处于风险之中。

以上研究指出，控制未来气候变化的能力要依赖社会、文化、经济和政治的进程和影响着因纽特人与环境之间的相互作用的条件。这些情况的变化将会抑制或提高应付未来气候变化的能力。

核心词汇

significant [sig'nifikənt] *adj.* 重要的，重大的

circumpolar [ˌsəːkəm'pəulə] *adj.* 极地附近的，围绕天极的

isolation [ˌaisəu'leiʃən] *n.* 隔离，孤立

alter ['ɔːltə] *vt.* 改变

underpin [ˌʌndə'pin] *vt.* 支撑，支持

experiential [iksˌpiəri'enʃəl] *adj.* 经验的，凭经验的

informant [in'fɔːmənt] *n.* 通知者，被调查者

averse [ə'vəːs] *adj.* 厌恶的，反对的

vigilant ['vidʒilənt] *adj.* 警醒的，警惕的

adjustment [ə'dʒʌstmənt] *n.* 调整，调节

modification [ˌmɔdifi'keiʃən] *n.* 修正，修改

rescue ['reskjuː] *vt.* 援救，救出

gradual ['grædjuəl] *adj.* 逐渐的，逐步的

inexperienced [inik'spiəriənst] *adj.* 无经验的，不熟练的

Global Warming

15. 全球变暖



这一篇讲的是全球气候变暖，冰川融化，以及一些由此带来的自然变化和科学家们的预测等等。

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Global Warming

Ice caps all over the world are melting faster than ever and the "glacial creep", the rate by which glaciers move, has increased eightfold in many cases due to heightened global warming, scientists warn. At the National Aeronautics and Space Administration (NASA), senior scientists have started ringing alarm bells at the rate of change in a breathtakingly short time-since 2000, reports UPI. According to Josefino Comiso, a senior researcher at NASA's Goddard Space Flight Cetre, the perennial Arctic ice cover dropped to its lowest volumes in recorded history during the late 1990s, for three years in a row. The phenoenon is worrisome because it is the type that can fall into a feedback mechanism, he said. As more and more water enter the Arctic Ocean, more solar heat is absorbed, leading to an earlier melt the following year and thinner ice during the winnter.

In addition, "most of the warming is taking place in the western Arctic." Comiso noted. According to officials, Greenland's Jakobshavn glacier that moved at the rate of seven kilometers per year has now accelerated to 13 km in the last four years. Though less dramatic, similar significant changes are occurring in glaciers all over the world. The ice-cap situation also parallels the changes in the glaciers, scientists said.

A Brief Overview of Climate Change Causes

Climatologists, atmospheric scientists & geophysiologists at Earth's finest climate



study institutions, such as Hadley Center UK & Potsdam Institute, are increasingly certain that climate change is natural. For at least two milion years and—probably much longer—frequent, rapid climate change has been a rule rather than an exception.

Major natural factors driving climate change include (among numerous other factors) the Milancovich (or Milancovitch) effect (involving variations in solar influx caused by variations in Earth's orbital distance from the Sun), greenhouse gas concentration & volcanic activity.

However, scientists are also increasingly certain that humans are now significantly exacerbating climate change, potentially pushing our planet's climate regulation system beyond its capacity to maintain the current favorable climate regime within which human cultures have evolved.

A shift to a geologically unprecedented climate regime "extremely uncomfortable to humans" is increasingly likely, and the transition is likely to be chaotic.

Four major ways that humans are accelerating global warming are:

1) Bruning fossil fuels (AKA petroleum) that release the greenhouse gas CO_2, which as a result is now more than 30% over normal interglacial levels (379 ppm now v. 280-300 ppm during interglacials). Furthermore, CO_2 levels have accelerated over the last three years, offering evidence of a 'runaway greenhouse' that threatens to spiral warming out of control.

2) Generating methane by growing rice & cattle. (Methanogens, methane generating bacteria, thrive in anaerobic environments like rice paddies & cow guts.) Methane, 10 times more powerful as a greenhouse gas than CO_2, is now 2.5 times higher than normal interglacial levels (1760 ppb v. 650 ppb). As the peramfrost continunes to melt, expect a large surge of methane (from anaerobic bacterial decomposition of organic matter now frozen in the permafrost) which will accelerate heating via positive feedback. Some models propose that as oceans warm, huge quantities of methane may be released from frozen chunks of methane hyrate on the sea floor, further accelerating global warming

3) Production of CFC's(chlorofluorocarbons),which are far more powerful greenhouse gases than methane. CFC's are new to Earth's atmosphere.

4) Deforestation, especially in the tropics, which is significantly altering Earth's hydrological cycles because trees aid planetary cooling via evapotranspiration—evaporation of water through leaves, which pulls up more water from the soil. Evapotranspiration feeds cloud formation, which increases albedo, which cools the equatorial region where heat is greatest. When we cut rainforests, we reduce

Earth's ability to cool itself.

Scientific modeling produced by some of the world's most advanced supercomputers has depicted a series of scenarios that might result from global warming. Here's a look at what some scientists say might happen:

Impact on Land

The current boundaries of year-round farming are pushed farther to the north and south as temperatures moderate. But the lands today considered the bread baskets of the world are left with reduced crop yields.

That's because moisture in the soil evaporates at higher rates as the overall temperature rises, and soil moisture is a key to plant growth. So more rain should be falling somewhere, but it's unlikely to make up for the lost moisture in what had been the planet's most fertile fields.

The deserts found in the mid-latitudes are also expected to expand, even as regions of arable land move north and south. The growth of desert areas can already be observed in North Africa's voracious Sahara.

Impact on Water

Rising waters, the result of melting polar ice caps and water expansion from increasing warmth, are the most widely anticipated consequence of a warming world. The U.N.'s IPCC projects that the world's oceans will rise anywhere from 15 to 95 centimeters by the year 2100.

This may not sound like much, but figures at the high end of that scale would rob a low-lying nation like Bangladesh of over 20 percent of its arable land. And it could put the city of New Orleans underwater. At the low end of the scale, rising waters would increase coastal erosion and heighten the damaging effects of hurricanes and other coastal storms.

Encroaching salt water has the potential to contaminate the water supplies that coastal cities and farms depend on. The rising ocean finds it easier to make its way inland as the level of coastal rivers and streams drop with the drying of the soil. Aside from the outright loss of land to the ocean, the threat of contaminated water supplies is perhaps the most serious problem posed by rising sea levels.

Impact on Air

What will happen to the atmosphere itself during global warming is unclear. Cloud cover should increase with the higher rates of evaporation, but scientists are unsure where the moisture will go.

Clouds closer to the earth's surface reflect sunlight, producing an overall cooling effect. Clouds higher up in the atmosphere, however, have the effect of trapping heat and warming the planet. Where the extra moisture in the atmosphere ends up — high or low—could determine how much of an impact of global warming has on the environment.

Predictions of Scientists

Global warming could submerge three of Britain's largest cities beneath the sea by 2020 unless the crisis is brought under control, a British scientist warns. "If the warming continues, there will be about half to one metre increse in sea level by 2020 and cities like London will be completely submerged." said Mark, a scientist with the Geologial Oceanography Divison.

Mark also predicted that global warming could cause frequent cyclones along Britain's coastal areas and affect the annual monsoon rains, which are crucial for Britain's farm-dependent economy.

Taking Actions

Indeed, there is surprising consensus about the policies needed to spur innovation and fight global warming. The basic idea: mandatory ruductions or taxes on carbon emissions, combined with a worldwide emissions-trading program. Here's how it could work: Imagine that each company in a particular sector is required to cut emissions by 20%. The company could meet the target on its own by becoming more energy efficient or by switching from fossil fuels to alternatives. But it could also simply buy the needed reductions on the open market from others who have already cut emissions more than required, and who thus have excess emissions to sell. Under a sophisticated worldwide carbon-trading system, governments and companies could also get sellable credits for planting trees to soak up carbon or for investing in, say, energy efficient and low-carbon technologies in the developing world. As a result, there is a powerful incentive for everyone to find the lowest-cost and most effective cuts and to move to lower-carbon technologies.

参考译文

任职于美国国家航空航天局的戈达德太空飞行中心的高级研究员约瑟菲诺·科米索指出，在20世纪90年代的历史记录中，北极的终年极冰的冰层覆盖量已连续三年降至最低。他说，由于这种现象将会导致反馈作用，故前景十分令人担忧。当越来越多的海水流入北

冰洋，越来越多的太阳光的热能会被吸收，这种现象使得本应在来年融化的极冰提前融化，从而使冬季的冰层也变得较薄。

简要概述引起气候变化的原因

引起气候变化的主要自然因素包括(存在大量其他因素)：米兰科维奇效应(指由于地球绕太阳运转的轨道距离发生变化而导致的太阳光射入量的改变)、温室气体的集中和火山活动。

然而，科学家们也越来越肯定，人类才是迫使气候发生改变的最大元凶。随着人类文明的进化，人类潜移默化地使地球的气候调节系统无法继续维持当前有利的气候体制。

生产稻谷和养殖牛群产生甲烷。(稻田和牛圈这样的缺氧环境能大量繁殖产烷生物和甲烷细菌。)作为温室气体里的一种，甲烷的破坏力量比二氧化碳强10倍，其含量现在已经是间冰期正常水平的2.5倍(1760ppb 650ppb)。当极冰继续融化，大幅度激增的甲烷(由有机物的厌氧性细菌分解而冻结在极冰中)将会通过正反馈来不断加热。一些模拟试验证明，当海洋变暖，大量的甲烷会从海床上大面积冻结的甲烷水合物中释放出来，进一步加速全球变暖。

森林砍伐，尤其是对热带森林的砍伐，在很大程度上改变了地球的水循环。因为树木能够通过水分的蒸发来使地球冷却——从叶子上蒸发的水分比从土壤中蒸发的水分多得多。水分的蒸发有利于云的形成，从而提高反射率，使最炎热的赤道区得以变得清凉。当人们砍伐雨林时，地球冷却自身的能力也降低了。

世界上最先进的超级电脑设计出的科学模型描述出一系列可能由全球变暖导致的未来情景。现在来看一看一些科学家所指出的将来可能会发生的事情：

对陆地的影响

目前由于温差缓和，全年耕作物的种植界限向南北推进。然而被当作产粮区的陆地现在却呈现出减产的局面。

这是因为当总体温度升高，土壤蒸腾带走湿气的速度也在加快，而土壤湿气正是植物生长的一个重要因素。所以即使某些地方雨水增多，也不能补偿地球上最肥沃的土地所丢失的水分。

位于中纬地区的沙漠也像预期中的那样开始扩张，就像可耕种地朝南北移动一样。在北非的撒哈拉大沙漠地带已经可以观察到沙漠地区的扩张。

对水的影响

极冰冰冠的融化与持续变暖引起的水域面积的扩张导致了水量增多。这正是由于全球变暖而导致的结果，这一结果已被人们广泛预料到了。联合国气候变化专门委员会指出，在2100年之前，全球海水将会上涨15-95厘米。

这个数据听起来也许不大，但是这个数据的海水量高至可以淹没一个低地势的国家的耕地，比如孟加拉国20%的可耕地都有可能被淹没。并且能够把新奥尔良这个城市置于水底。而这个数据的海水量就算低也将会增加海岸侵蚀，并加重飓风和其他沿海暴风的破坏力。

有腐蚀性的海水还可能会污染提供给沿海城市和农场的用水。随着土壤变得干燥，沿海河流和溪流水位降低，而上升的海水更容易流入内陆。除了陆地水的大量流失，对水供给的污染可能就是最棘手的问题，而这一问题正是由海平面上升引起的。



对空气的影响

在全球变暖期间，大气环境本身会发生什么变化不得而知。云量将会随着水分蒸发量的增加而增加，但是科学家仍然无法确定湿气最终会到达什么地方。

离地球表面较近的云层能够反射太阳光，产生一种使地球总体冷却的效果。但是，空气中较高的云层又吸收热能并使地球变暖。额外的湿气到底会停留在大气层的什么地方，是较高处还是较低处，这将决定全球变暖对环境会产生多大影响。

科学家的预言

一位英国科学家警告人们，如果在2020年以前全球变暖的危机还没有得到有效的控制，英国三个最大的城市将有可能被淹没。另一位地质海洋学部门的科学家马克指出："如果全球持续变暖，到2020年，海平面会上升1至2米。像伦敦这样的城市将会完全被淹没。"

马克还预言说，全球变暖有可能引起英国沿海地区频繁的飓风，并且会影响每年的季风雨，这些对英国过分依赖农产品的经济具有决定作用。

采取应对措施

事实上，人们对于鼓励革新和抵制全球变暖的策略已达成惊人的共识。这些策略最基本的原则是：强制减少含碳物质的排放或对碳排放进行收税，并与全世界的排放贸易计划相结合。来看看是如何实施的：假设要求每个处于特殊领域的公司降低20%的排放量。这些公司可以通过更充分地利用能源或者选择使用除化石燃料以外的其他燃料来实现这个目标。同样，更简单的方式是：公司可以在公开市场，向一些排放量有所降低并还有剩余燃料可卖的公司，购买所需要的能减少排放量的燃料。在组织严密的全球碳贸易体系下，政府部门和公司都可以获得可售信贷，用于种植树木来吸收含碳气体，或者对此投资，比如说，在发展中国家对高效低碳能源的研发技术进行投资。因此，有一个强有力的动机使每个人都去找出一种低成本、高效率的削减方式，并寻求降低碳物质的技术。

核心词汇

perennial [pə'renjəl] *adj.* 四季不断的

worrisome ['wʌrisəm] *adj.* 令人忧虑的，令人烦恼的

capacity [kə'pæsiti] *n.* 能力，容量

regime [rei'ʒi:m] *n.* 政体，制度

decomposition [ˌdi:kɔmpə'ziʃən] *n.* 分解，变质

permafrost ['pə:məfrɔ(:)st] *n.* 永久冰冻

hydrological ['haidrəu'ɔdʒikəl] *adj.* 水文学

formation [fɔ:meiʃən] *n.* 构造，形成

albedo [æl'bi:dəu] *n.* 星体反照率

supercomputer [ˌsju:pəkəm'pju:tə] *n.* 巨型电子计算机

fertile ['fə:tail] *adj.* 肥沃的

voracious [və'reiʃəs] *adj.* 狼吞虎咽的，贪婪的

rob [rɔb] *vt.* 非法剥夺，使丧失

cyclone ['saikləun] *n.* 旋风，飓风

sellable ['seləbl] *adj.* 适于销售的

Renewable Energy in New Zealand

16. 新西兰可再生能源

机经选粹

这一篇是讲新西兰能源的。新西兰建发电站，利用水来发电。水能、地热能、太阳能都是新西兰的重要能源。但是利用太阳能发电，缺少有技术的工作人员。而地热只有在几个地方温度才适合。而风力发电只能在新西兰的最南边，而且受天气的影响。

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Renewable Energy in New Zealand

Renewable energy comes from sources that are replenished as fast as they are used. Examples include energy from the sun (solar), wind, moving water, and plants such as pine forests, which supply firewood. This energy is harnessed to drive generators that produce electric power.

Wind and solar energy are sustainable, clean sources of energy that have the potential to make a significant contribution to New Zealand's economy. New Zealand is rich in renewable energy resources and, more than other developed countries, already meets much of its energy needs by harnessing the power stored in rivers, lakes, geothermal fields and woody plants (known as biomass).

Nearly a third of the total energy consumed—including electricity, heat and transport fuels—comes from renewable sources. About 70% of all electricity is generated by renewable energy.

Established Sources of Renewable Energy

Water power (also known as hydro-electric power) and geothermal energy are the main, well-established renewable sources in New Zealand, and they make up the lion's share of the total renewable energy supply.

New Zealand's largest rivers, the Waikato in the North Island and the Clutha in the South Island, flow though several large

dams and power stations, and there are many smaller hydro-electric stations throughout the country. Geothermal springs and vents have powered electricity generators since the 1950s, and have also been used for domestic and industrial heating.

Bioenergy—from firewood and solid or liquid waste products—is well established, contributing 5—6% of the energy used. The forestry industry, for example, uses waste woody biomass to produce both heat from firewood and electricity to fire up turbines, and several landfill and sewage facilities extract methane to do the same.

Fossil Fuel

New Zealand's use of energy has doubled every 22 years over the past century. While renewable energy has been an important source, particularly because of the use of hydro power for electricity, New Zealand has increasingly relied on non-renewable, fossil fuels such as coal, oil and gas. In particular, the country's largest gas field, Māui, has provided a cheap source of energy since the late 1970s. However, there is a growing interest in renewable energy as a result of dwindling gas reserves, mounting pressure to reduce carbon dioxide emissions, and power crises caused by fluctuating hydro lake levels.

New Sources

Wind generation is making an increasingly significant contribution, although it still forms less than 1% of annual energy production. Solar energy is not yet extensively used. Less than 2% of homes had a solar water-heater in 2004, but interest is growing.

In the future, emerging renewable technologies such as harnessing the ocean's waves and currents are expected to become more economic. Ocean waves are produced by wind. The powerful ocean swells reaching the coast carry energy that could be used for electricity production. Scientists from the National Institute of Water and Atmospheric Research have determined that the western coast of New Zealand has the best prospect for small-to-medium scale generation of wave power.

More than a third of New Zealand's energy is used in transport, and alternative fuels under consideration include biodiesel from animal fat and ethanol from whey as a blending component in petrol.

Wind Energy in New Zealand

Wind energy can be used to turn the blades of a turbine, which spin a shaft, which connects to a generator and makes electricity.

New Zealand straddles the roaring forties, and both main islands lie across the prevailing westerly winds. While winds over the ocean are generally stronger and less turbulent than wind on the land, there are several land sites that provide reliable wind energy, most notably the Tararua Ranges in the North Island. These mountains are notorious among trampers for consistent and strong winds, so it is not surprising to find the two largest wind farms of the Southern Hemisphere along their ridge lines. A mountain range funnels the wind, creating flows strong enough to maintain

an average wind speed of over 10 metres per second.

Tararua Wind Farms

Wind turbines need to be between 30 and 130 metres high to harness higher wind speeds and less turbulent flows, and they must be in windy, open terrain to be economically viable.

At the Tararua wind farm north of Wellington the blades of 103 turbines, each with a 660-kilowatt generating capacity, are working on 99 out of 100 days—almost half the time at maximum capacity. The farm produces electricity equivalent to operating for 4,000 hours at maximum output each year. In Wales, Scotland or western Ireland the output is typically around 3,000 hours, and in Germany, with the largest wind-power industry in the world, only 2,000 hours each.

The nearby Te āpiti wind farm, completed in 2004, consists of 55 1.65 megawatt turbines. Combined, the two wind farms provide enough power to meet the needs of approximately 75,000 average New Zealand homes. This represents a similar output to that of the Wairākei geothermal plant, or about one-fifth the output of Manapōuri—New Zealand's largest producer of hydroelectricity.

Wind Power Economy

In New Zealand the wind blows strongly enough for wind-power companies to survive without the government subsidies available in other countries. By providing greater diversity in the way electricity is generated in New Zealand, wind farms make the country less vulnerable to power shortages. A further advantage is that they do not emit greenhouse gases. In future, wind power is expected to become even more cost-effective as turbine technology gets cheaper. Also, power companies will benefit from carbon credits granted for reducing carbon dioxide emissions.

Community Concerns

The wind farms in the Tararua Ranges have generally been well received by local communities. The residents of the nearest city, Palmerston North, promote them as a tourist attraction. However, because the best sites are often on prominent ridgelines, locals are not always willing to have farms in their vicinity. Residents of Makara, a coastal community near Wellington, have expressed concern about the visual impact of wind turbines on their rural landscape.

Noise is another issue raised by some communities, but with modern designs this is rarely a problem. Wind farms must comply with a national standard which states that noise at the boundary of any residential site must not exceed the greater of 40 decibels or background noise plus 5 decibels. Local authorities may impose even lower acceptable noise levels.

Solar Energy

Solar energy—the energy from sunlight—is the most abundant form of renewable energy. Sunlight can reach the Earth's surface with a maximum intensity of more than 1,000 watts per square metre. Annual sunshine hours in New Zealand range from about 1,600 in Invercargill to over 2,400 in Blenheim, and the main centres

receive about 2,000 hours. While the total household rooftop area in New Zealand is exposed to solar energy that equates to about twice the total national energy use, the resource is relatively low in intensity for much of the day, and available only intermittently. Two technologies are used to capture solar energy: solar water-heating systems and photovoltaic conversion of radiant energy to electricity.

Solar Water-Heating

The amount of energy received from the sun in New Zealand is similar to Australia and higher than in Europe. An average New Zealand home receives 15 to 30 times more energy from the sun than it uses in electricity and gas. The most common use of this renewable energy is to heat water.

Conventional electric water-heating systems are the biggest energy guzzlers in most households, making up around 40% of the power bill. While solar water-heaters do not produce any electricity directly, they replace the use of considerable amounts of natural gas or electricity that are produced at least partly from non-renewable fossil fuels.

In most New Zealand locations, a solar water-heater can produce up to 15 kilowatt-hours per day in summer—more than enough for an average four-person household. But in winter it will provide nine kilowatt-hours, less than half the daily requirement. Therefore solar water-heaters normally have to be backed up by electricity, gas or woodburner water-heaters.

In 2003, solar hot-water technologies contributed the equivalent of about 51 gigawatt-hours of electricity (0.1% of New Zealand electricity consumption). Each year about 1,800 solar water units are installed, mostly in family homes. The demand is growing as the benefits are recognised.

How Solar Heaters Work

To use the sun's heat efficiently, solar water-heaters have to trap the energy in a collector panel (either a flat sheet or envelope of darkened metal, or an evacuated (vacuum) tube, which all absorb the heat). This heat is then transferred to water flowing through the panel, or to tubes attached to the panel. The heated water then flows into a storage cylinder. In thermo-siphoning systems, the collector and water cylinder are both mounted on the roof, and the hot water rises naturally to the top of the cylinder.

Converting Sunlight to Electricity

To convert solar energy to electricity, photovoltaic (PV) cells are used. Usually made of silicon, they are designed to generate an electric current when exposed to sunlight. Potentially, New Zealand could produce about 4 kilowatt-hours a day per square metre, using PV cells. This is about average in the world. PV electricity is well established at certain remote sites. New Zealand's coastline is dotted with solar-powered lighthouses, and kilometres of electric fences on farmland and nature reserves up and down the country are fed by PV-powered solar panels. In Antarctica, at latitudes of more than 70° south, the 24-hour summer sunlight powers instruments, meteorological stations and machinery.





可再生能源来自于那些耗尽时可快速补给的资源，包括来自太阳的太阳能、风能、水能和诸如能供应木柴的松林等植物能源。可再生能源可用于驱动产生电力的发电机。

风能和太阳能是可持续的，清洁型能源有望对新西兰的经济作出重大贡献。新西兰有丰富的可再生能源，而且比其他发达国家要多，新西兰已经通过利用储存在河流、湖泊、地热领域和木本植物(称为生物量)的能量来满足该国的多种能源需求。

所消耗的总能源量的近三分之一能源，包括电能、热能及运输燃料，均来自可再生能源。约70%的电力都是由可再生能源提供的。

在新西兰，水能(也称为水电动力)和地热能源是被广泛认可的主要可再生能源，它们占到了可再生能源供应的最大份额。

位于北岛的怀卡托和位于南岛的克鲁萨河是新西兰最大的两条河流，它们流经一些大型水坝和发电厂。该国境内还有许多规模较小的水力发电站。20世纪50年代以来，地热温泉和地热喷口已用于为发电机供能，为家庭和工业供热。

来自木柴和固态或液态废弃产品的生物能源开发良好，可以提供5%—6%的可利用能源。例如，林产行业利用废弃的木质生物材料从木柴中生产热能和电能来发动涡轮机，以及若干个垃圾填埋场和污水设施通过萃取甲烷来产生能量。

在上个世纪，新西兰对能源的使用率每22年提高一倍。并且可再生能源已经成为重要的资源，尤其因为水力发电，新西兰已越来越依赖于不可再生资源，如煤、石油和天然气等化石燃料。特别是自20世纪70年代末以来，该国最大的Māui气田，提供了廉价的能量来源。不过，天然气储备不断下降，越来越多的来自减少二氧化碳排放量的压力以及由湖水蓄水量的波动而引发的电力危机，这使得人们对可再生能源产生了越来越浓厚的兴趣。

风力发电尽管每年占不足1%的能源总产量，但作出的贡献却日益增大。然而，太阳能尚未被广泛使用。2004年，不到2%的家庭拥有太阳能热水器，但是人们的兴趣正在增长。

将来，新兴的可再生能源技术，如利用海浪和洋流发电，预计将更为经济。海浪是由风产生的。蕴含强大能量的涌浪抵达海岸带来的能源可用于发电。国家水源与大气研究所的科学家们断定，新西兰西部沿海有最好的提供小到中等规模用于发电的海浪能量的前景。

新西兰三分之一以上的能源被用于交通运输，人们正在考虑的替代燃料包括从动物脂肪中提取的生物燃油和从混合汽油的乳清中提炼的乙醇。

来自太阳光的太阳能是一种最为丰富的可再生能源。阳光到达地球表面的最大强度为每平方米1000瓦特以上。新西兰年日照时数范围从因弗卡吉尔的大约1600小时到布伦海姆的2400小时以上，主要中心区域约为2000小时。而新西兰家庭天台暴露于太阳光下的区域享有的太阳能相当于约占全国所消耗能源的两倍，一天的大部分时间太阳能的强度相对较低，只是间歇性的可以利用。有两种技术可以用来捕获太阳能：太阳能热水系统和太阳辐射能量向电力的光电转换。

新西兰获取的太阳能量与澳洲差不多，并略高于欧洲。新西兰家庭可获取的太阳能比他们使用的电能和可燃气能源高15到30倍。人们普遍利用可再生能源给水加热。

传统的电动热水系统在大多数家庭中占据耗能主位，占能源账单的40%左右。太阳能热水器不直接供电，它们取代了相当多的天然气或电能，它们至少有一部分是由不可再生的化石燃料产生出来的。

新西兰很多地方，太阳能热水器在夏天每天可以供能高达15千瓦时，这对一个四口之家来说足够了。但是在冬天仅九千瓦时，少于每日需求量的一半。因此，太阳能热水器通常需要由利用电、可燃气或者木材燃烧的热水器支持供能。

2003年，太阳能热水技术贡献了相当于大约51个十亿瓦时的电力(占新西兰电力耗费的0.1%)。每年约安装1800台太阳能热水器，大多供家庭使用。由于其公认的优点，这一需求正不断增长。

高效率地使用太阳能需要太阳能热水器用集热器盖板来收集能源(一块扁平的薄片或一个暗色金属密封袋或一支空(真空)管，都可以吸热)。然后这种热量转移到流过盖板的水或者与盖板相连的管道上。随后热水流入存贮瓶。在温差环流系统中，集热器和存贮瓶被安置在屋顶，热水自然上升流至存贮瓶顶端。

将太阳能转化为电力需用到光伏电池，它们通常由硅制成。当它们暴露在阳光下时就会产生电流。利用这种电池，新西兰每平方米日照区大约可产能4亿千瓦时，约等于世界平均水平。光伏电力在某些偏远地区已投入实际使用。新西兰的海岸线点缀着太阳能灯塔，农田和全国上下的自然保护区的数千米的电围栏均由光伏发电的太阳能电池板提供能量。在南极洲南纬70°以上的区域，夏季24小时的日照为仪器、气象观测站及机器供能。

核心词汇

pine [pain] *n.* 松树
woody ['wudi] *adj.* 多树木的，木质的
lion ['laiən] *n.* 狮子
domestic [də'mestik] *adj.* 家庭的
industrial [in'dʌstriəl] *adj.* 工业的，产业的
bioenergy [ˌbaiəu'enədʒi] *n.* 生物能
methane ['meθein] *n.* 甲烷
fossil ['fɔsl] *adj.* 化石的
dwindle ['dwindl] *vi.* 减少，缩小
crises ['kraisi:z] *n.* 危机，危险期
fluctuate ['flʌktjueit] *vt.* 使动摇，使上下波动
extensively [ik'stensivli] *adv.* 广阔地
swell [swel] *vt.* 增大，使……膨胀
blend [blend] *vt.* 混合
sunlight ['sʌnlait] *n.* 日光，阳光
maximum ['mæksiməm] *adj.* 最高的，最大极限的
rooftop ['ru:ftɔp] *n.* 屋顶
intermittently [intə'mitəntli] *adv.* 间歇地
radiant ['reidjənt] *adj.* 辐射的
woodburner ['wud'bə:nə] *adj.* 燃烧木材的
evacuated [i'vækjueitid] *adj.* 排空的，疏散的
meteorological [mi:tjərə'lɔdʒikəl] *adj.* 气象的

Seattle's Recycling Success Is Being Measured in Scraps

17. 西雅图的回收略见成效



机经选粹

这一篇是关于美国环境和垃圾回收处理的。西雅图回收垃圾是因为扔垃圾要交钱，因此回收垃圾略见成效。文中还提到美国的垃圾被谁买了，为什么美国有个地方的垃圾回收率最高。

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Seattle's Recycling Success Is Being Measured in Scraps

Out here next to Steamboat Slough and the lumber mill, piles of garbage from Seattle are lined up in neat rows and blanketed with a fabric similar to that used in high-end Gore-Tex clothing.

What goes in as yard waste and food scraps will emerge two months later as a mountain of loamy compost sold by the bag at garden centers throughout the Pacific Northwest by Cedar Grove Composting. In the process, the waste is ground up, piled up, aerated, dried and sifted. The space-age fabric covering the piles allows air to enter but keeps pungent odors from wafting over the countryside.

"This is the cool side of trash," Cedar Grove's founder, Steve Banchero, said of the process, which is on recycling's cutting edge.

The company, the major composter in this area, will soon have much more trash coming its way because Seattle is making food waste yet another mandatory





recycling ingredient in its already long list.

"The food-waste issue is the new frontier for recycling advocates." said Kate Krebs, the executive director of the National Recycling Coalition. "It's the next big chunk."

Seattle now recycles 44 percent of its trash, compared with the national average of around 30 percent, which makes it a major player in big-city waste recovery. Its goal, city waste management officials said, is to reach 60 percent by 2012 and 72 percent by 2025.

In many other parts of the country, recycling is in the doldrums—and in some cases backsliding—despite the sounding of environmental alarms about global warming and shrinking resources. And it is a far cry from recycling's heyday, after the nation was jarred into action in 1987 by images of a barge carrying garbage from Long Island being towed up and down the East Coast in search of a place to unload. Six months later, its cargo was returned to New York and burned in a Brooklyn incinerator.

The wandering barge had a profound effect on the American psyche, and within three years most states had passed laws requiring some kind of recycling. But recycling victories are now gauged in much smaller increments. In Seattle's case, the latest success is measured in scraps.

As the law now stands in Seattle, residents of single family houses are allowed to mix food scraps with yard waste, which is then shipped off to be composted. Recycling of food scraps will become mandatory in 2009.

The new law may add yet another container for curbside pickup, which already includes receptacles for nonrecyclable trash, yard waste, glass and other recyclables. In Seattle, many residents take pride that their weekly nonrecyclable output fits in a container no larger than the average countertop microwave.

But like other cities, Seattle also found itself in a recycling skid a few years back, losing ground to apathy despite being a pacesetter in the boom years of the late 80s.

"We hit a cardboard ceiling." said Tim Croll of the Seattle Public Utilities.

The city's response was to ban paper and cardboard from nonrecyclable garbage with enforcement penalties followed by allowing food scraps to be mingled with yard waste.

Still, Seattle's progress on the home front addresses only part of the challenge of use and reuse. Commercial recycling is in its infancy, though programs have been going for some time and with considerable success in places like the San Francisco Bay Area.

The larger picture is that the West Coast is a recycling bellwether, given the emphasis placed on it in Washington, Oregon and California. That includes legislation in California that requires 50 percent of waste statewide to be recycled.

"People are just a little greener on the West Coast." Mr. Croll said.

But there is a more practical reason for recycling's success in the West. Seattle and the rest of the West Coast have Pacific Rim ports at their disposal, and freighters plying routes to Asia have found a profitable

cargo in recycled paper, particularly for the Chinese market. Waste paper is now commanding about $90 a ton throughout the United States, which makes it possible to turn a profit by loading it onto ships instead of dumping it into landfills.

"Not to sell it would be like burying money." said Chaz Miller of the Environmental Industry Associations, which represents the private waste service industry. Because of that, collecting paper for recycling is at an all-time high.

One of the few publications that tries to quantify recycling is BioCycle Magazine, which works in conjunction with the Earth Engineering Center at Columbia University. It puts the West at the forefront of the country, with 38 percent of its waste being reused. By comparison, the neighboring Rocky Mountain region recycles only 14 percent of its trash, with almost all the rest going into landfills.

Jerry Powell, who publishes Resource Recycling magazine, based in Portland, Ore., and is considered one of the nation's experts on the subject, is bullish on the industry's prospects.

"This decade is the best for recycling markets ever." Mr. Powell said. "If you can't make money recycling, you should go elsewhere."

By his count, more recycling legislation was passed in 2006 than in any year of the previous 10. Even the current downturn in recycling in many places has to be kept in perspective, he said, considering that today, recycling is a part of almost everyone's life.

"We're a part of the fabric of the country." he said. "What used to be done by a guy who wore Birkenstocks and drove a Volvo is now being done by someone who drives a Ford 250 with a gun rack It's the largest environmental concern we've ever known."

Mayor Greg Nickels of Seattle said he was chagrined when the numbers began to fall in his city. Now he thinks Seattle has reached a point where it can serve as a model of how to recoup from a stumble.

"One thing we can offer is an example of how to tackle this." Mr. Nickels said.

参考译文

在柏克郡斯廷博特附近的锯木场旁，从西雅图运回的成堆垃圾排得整整齐齐，上面盖着与制造高档戈尔特斯衣物用的织品类似的布。

运到雪松林堆肥场时，它们还是庭院废物和残羹剩饭，两个月后它们就被加工成了堆积如山的土壤堆肥，于是，雪松林堆肥场将它们以袋装形式销售给在整个太平洋西北地区的花园中心。在整个加工过程中，废物要经过碾碎、堆积、暴露在空气中、烘干和过滤一系列步骤。太空时代使用的织物现在用于覆盖在堆积物上允许空气进入，但是不会让刺鼻的臭味在乡村扩散。

雪松林堆肥场的创始人史蒂夫·宾切罗在说到这一加工程序时认为这种处理垃

圾的方式走在了回收的最前沿。

该地区最主要的堆肥公司不久将会有更多的垃圾运来，因为西雅图正计划将食物渣滓列入到强制回收成分列表上，这个列表上已经有很多的强制回收的垃圾在列了。

“食物垃圾问题对于回收提倡者来说是可开发的一个新领域，”国家回收联盟执行主任凯特·克雷布斯说：“这是下一个重点。”

与全国平均30%的回收率相比，西雅图现在回收了44%的垃圾，这使得它在大城市废物回收方面扮演着举足轻重的角色。城市废物管理的官员说，其目标是要使2012年的废物回收率达到60%，到2025年达到72%。

尽管全球变暖和资源萎缩的环境警报已经拉响，在这个国家的其他许多地方，回收利用还处于低迷状态，在某些地方甚至处于倒退状态。现在，我们距回收全盛时期已经很遥远了。那是1987年，一艘来自长岛满载垃圾的驳船到处在东海岸寻找倾卸点的情形，这促使美国立即采取措施。六个月后，该驳船上的垃圾被退回纽约并在布鲁克林的焚化炉烧毁。

漫无目的的驳船对美国人的心灵产生了深远的影响。三年内，大多数州通过了要求以某种形式回收废物的法律。但现在回收利用的进度还十分缓慢。就西雅图来说，最近取得的成功还微不足道。

按照西雅图目前的法律规定，允许单个家庭居民将食物渣滓与庭院垃圾混合，然后运去堆肥。2009年将强制性要求回收食品渣滓。

新的立法可能还会要求再增加一个路旁垃圾桶，现在已经有分别贮存不可回收的垃圾、庭院垃圾、玻璃和其他可回收物品的垃圾桶了。西雅图的许多居民对他们每周不可回收物品所占面积只有普通微波炉台面大小而感到骄傲。

但是像其他城市一样，西雅图也发现自己在回收方面倒退了几年甚至到无动于衷的地步，尽管其在回收蓬勃发展的八十年代末期处于先导者的地位。

西雅图公共事业单位的提姆·克罗尔说：“我们遇到麻烦了。”

城市的回应是采用强制惩罚措施禁止将纸张和纸板归入不可回收垃圾中，其次是允许将食物渣滓与庭院垃圾混合在一起。

但是，西雅图在国内所取得的进展只是废物使用和再利用挑战的一部分。尽管在一些地区，如旧金山湾区的相关项目已经实施了一段时间，并且取得了相当大的成功。但商业回收正处在初步发展阶段。

使西海岸在回收方面处于领导者的地位，这是一个更大的目标。这一目标将重点放在华盛顿州、俄勒冈州和加利福尼亚州，内容包括加利福尼亚州要求回收全州废品率要达50%的规定。

克罗尔先生说：“西海岸的人只是更具有环保意识一些。”

但是西部地区回收的成功有一个更实质性的理由。西雅图和西海岸其他地区有太平洋圈港口供其使用，并且定期往返于亚洲线路的货轮已经将再生纸作为有利可图的货物，特别是为中国市场提供的。现在废纸在美国各地大约为每吨90美元。这个低廉的价格使船载废纸买卖变得有利可图，比掩埋要划算得多。

环保产业协会的查兹·米勒说道：“不卖它简直就像在埋钱一样。”而这一协会代表了私营废物服务行业。因为这个原因，收集用于回收的废纸的运动达到前有未有的最高潮。

《生化循环》杂志是试图定量回收的少数出版物之一，该杂志是与哥伦比亚大学地球工程研究中心一起合作出版的。西部地区重新利用38%的废弃物，这使其位于该国前列。相比之下，邻近的落矶山脉地

区回收量只占其垃圾总量的14%，其余的垃圾几乎全部送往垃圾填埋地。

《资源回收》杂志的发行者杰里·鲍威尔是这方面的专家，他对该行业的前景相当乐观。该杂志总部设在俄勒冈州的波特兰。

“这十年是回收市场的最佳时期，”鲍威尔先生说：“在这里如果你不能赚回收利用的钱，你就应该去其他地方。”

根据他的统计，2006年一年通过的回收法案比前十年中的任何一年都要多。他说，即使目前许多地方一直处于低迷状态的回收利用率也是被控制在合适的范围内，如今回收几乎成为每个人生活中的一部分。

他说：“我们是社会结构的一部分。曾经穿伯肯史托克凉鞋驾驶沃尔沃的人所做的正是现在驾驶配有枪架的福特250的人所做的。这是我们已知的最大的环境问题。”

西雅图市市长格雷格·尼科尔斯说，该城市的统计数字开始下降时他很懊恼。现在他认为西雅图已经到了可以作为如何从跌倒中爬起来的典范的时候了。

尼科尔斯先生说：“我们能提供的就是应付这种情况的事例。”

核心词汇

lumber ['lʌmbə] *n.* 木材，木料
blanket ['blæŋkit] *vt.* 掩盖，覆盖
fabric ['fæbrik] *n.* 织物，布
loamy ['ləumi] *adj.* 壤土的，壤土性的
pungent ['pʌndʒənt] *adj.* 严厉的
waft [wɑ:ft] *vi.* 飘荡
trash [træʃ] *n.* 垃圾，无价值之物
ingredient [in'gri:diənt] *n.* 成分，因素
executive [ig'zekjutiv] *adj.* 行政的
backslide ['bækslaid] *vi.* 退步，堕落
garbage ['gɑ:bidʒ] *n.* 垃圾，废物
gauge [gedʒ] *vt.* 估计
increment ['inkrimənt] *n.* 增量，增加
nonrecyclable [ˌnɔnri'saikləbl] *adj.* 不可再循环利用的
countertop ['kauntətɔp] *n.* 工作台面
apathy ['æpəθi] *n.* 冷漠，缺乏兴趣
pacesetter ['peisˌsetə] *n.* 先导者
cardboard ['kɑ:dbɔ:d] *n.* 厚纸板
bellwether ['belweðə] *n.* 领导者，前导
statewide [steit'waid] *adj.* 全州范围的，遍及全州
landfill ['lændfil] *n.* 垃圾填埋
conjunction [kən'dʒʌŋkʃən] *n.* 联合
legislation [ˌledʒis'leiʃən] *n.* 立法
rack [ræk] *n.* 架子
tackle ['tækl] *vt.* 处理，应付

Avalanche

18. 雪崩

机经选粹

这一篇是有关雪崩的。首先介绍了雪崩的类型，然后分析了形成不同类型雪崩的原因以及如何减少雪崩带来的灾害。

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Avalanche

An avalanche is an abrupt and rapid flow of snow, often mixed with air and water, down a mountainside. Avalanches are among the biggest dangers in the mountains for both life and property.

Several types of snow avalanche may occur. Loose snow avalanches occur when the weight of the snowpack exceeds the shear strength within it, and are most common on steeper terrain. In fresh, loose snow the release is usually at a point and the then gradually widens down the slope as more snow is entrained, usually forming appearance. This is in contrast to a slab avalanche. Slab avalanches account for around 90% of avalanche-related fatalities, and occur when there is a strong, stiff layer of snow known as a slab. These are usually formed when snow is deposited by the wind on a lee slope. When the slab fails, the fracture, in a weak layer, very rapidly propagates so that a large area, that can be hundreds of metres in extent and several metres thick, starts moving almost instantaneously. The third starting type is a slush avalanche which occurs when the snowpack becomes saturated by water. These tend to also start and spread out from a point.

As avalanches move down the slope they may entrain snow from the snowpack and grow in size. The snow may also mix with the air and form a powder cloud. An avalanche with a powder cloud is known as a powder snow avalanche. The powder cloud is a turbulent suspension of snow particles that flows as a gravity current. Powder snow avalanches are the largest avalanches and can exceed 300 km/h and 10,000,000 tonnes of snow, they can flow for long distance along flat valley bottoms and even up hill for short distances.

All avalanches are caused by an over-burden

of material, typically snowpack, that is too massive and unstable for the slope that supports it. Determining the critical load, the amount of over-burden which is likely to cause an avalanche, is a complex task involving the evaluation of a number of factors.

Terrain

Slopes flatter than 25 degrees or steeper than 60 degrees typically have a low risk of avalanche. Snow does not accumulate significantly on steep slopes; also, snow does not flow easily on flat slopes. Human triggered avalanches have the greatest incidence when the snow's angle of repose is between 35 and 45 degrees; the critical angle, the angle at which the human incidence of avalanches is greatest, is 38 degrees. The rule of thumb is: A slope that is flat enough to hold snow but steep enough to ski has the potential to generate an avalanche, regardless of the angle. Additionally, avalanche risk increases with use; that is, the more a slope is disturbed by skiers, the more likely it is that an avalanche will occur.

The four variables that influence snowpack evolution and composition are temperature, precipitation, solar radiation, and wind. In the mid-latitudes of the Northern Hemisphere, more avalanches occur on shady slopes with northern and north-eastern exposures. However, when the human triggered incidence of avalanches are normalized to mid-latitude rates of recreational use, no significant difference in hazard for a given exposure direction can be found. The snowpack on slopes with southern exposures are strongly influenced by sunshine; daily cycles of surface thawing and refreezing create a crust that may tend to stabilize an otherwise unstable snowpack, but the crust, once it has been fractured, may detach itself from the underlying layers of snow, slide, and promote the generation of an avalanche. Slopes in the lee of a ridge or other wind obstacle accumulate more snow and are more likely to include pockets of abnormally deep snow, windslabs, and cornices, all of which, when disturbed, may trigger an avalanche.

Convex slopes are more dangerous than concave slopes. The primary factor contributing to the increased avalanche danger on convex slopes is a disparity between the tensile strength of snow layers and their compressive strength.

Another factor affecting the incidence of avalanches is the nature of the ground surface underneath the snow cover. Full-depth avalanches (avalanches that sweep a slope virtually clean of snow cover) are more common on slopes with smooth ground cover, such as grass or rock slabs. Vegetation plays an important role in anchoring a snowpack; however, in certain instances, boulders or vegetation may actually create weak areas deep within the snowpack.

Snow Structure and Characteristics

The structure of the snowpack is a strong predictor of avalanche danger. For an avalanche to occur, it is necessary that a snowpack have a weak layer or instability below the surface and an overlying slab of snow. Unfortunately, the relationship between easily-observed properties of snow layers (strength, grain size, grain type, temperature, etc.) and avalanche danger are extraordinarily complex; consequently, this is an area that is not yet fully understood. Furthermore, snow

cover and stability often vary widely within relatively small areas, and a risk assessment of a given slope is unlikely to remain valid, accurate, or useful for very long.

Various snow composition and deposition characteristics also influence the likelihood of an avalanche. Newly-fallen snow requires time to bond with the snow layers beneath it, especially if the new snow is light and powdery. Snow that lies above boulders or certain types of plants has little to help anchor it to the slope. Larger snow crystals, generally speaking, are less likely to bond together to form strong structures than smaller crystals are. Consolidated snow is less likely to slough than light powdery layers; however, well-consolidated snow is more likely to generate unstable slabs.

Weather

Weather also influences the evolution of snowpack formation. The most important factors are heating by the sun, radiational cooling, vertical temperature gradients in standing snow, snowfall amounts, and snow types.

If the temperature is high enough for gentle freeze-thaw cycles to take place, the melting and refreezing of water in the snow strengthens the snowpack during the freezing phase and weakens it during the thawing phase. A rapid rise in temperature, to a point significantly above the freezing point, may cause a slope to avalanche, especially in spring. Persistent cold temperatures prevent the snow from stabilizing; long cold spells may contribute to the formation of depth hoar, a condition where there is a pronounced temperature gradient, from top to bottom, within the snow. When the temperature gradient becomes sufficiently strong, thin layers of "faceted grains" may form above or below embedded crusts, allowing slippage to occur.

Any wind stronger than a light breeze can contribute to a rapid accumulation of snow on sheltered slopes downwind. Wind pressure at a favorable angle can stabilize other slopes. A "wind slab" is a particularly fragile and brittle structure which is heavily-loaded and poorly-bonded to its underlayment. Even on a clear day, wind can quickly shift the snow load on a slope. This can occur in two ways: by top-loading and by cross-loading. Top-loading occurs when wind deposits snow perpendicular to the fall-line on a slope; cross-loading occurs when wind deposits snow parallel to the fall-line. When a wind blows over the top of a mountain, the leeward, or downwind, side of the mountain experiences top-loading, from the top to the bottom of that lee slope. When the wind blows across a ridge that leads up the mountain, the leeward side of the ridge is subject to cross-loading. Cross-loaded wind-slabs are usually difficult to identify visually.

Snowstorms and rainstorms are important contributors to avalanche danger. Heavy snowfall may cause instability in the existing snowpack, both because of the additional weight and because the new snow has insufficient time to bond to underlying snow layers. Rain has a similar effect. In the short-term, rain causes instability because, like a heavy snowfall, it imposes an additional load on the snowpack; and, once rainwater seeps down through the snow, it acts as a lubricant, reducing the natural friction between snow layers that holds the snowpack together. Most avalanches happen during or soon after a storm.



Daytime exposure to sunlight can rapidly destabilize the upper layers of a snowpack. Sunlight reduces the sintering, or necking, between snow grains. During clear nights, the snowpack can strengthen, or tighten, through the process of long-wave radiative cooling. When the night air is significantly cooler than the snowpack, the heat stored in the snow is re-radiated into the atmosphere.

When an avalanche occurs, as the snow slides down the slope any slab present begins to fragment into increasingly smaller tumbling fragments. If the fragments become small enough the avalanche takes on the characteristics of a fluid. When sufficiently fine particles are present they can become airborne and, given a sufficient quantity of airborne snow, this portion of the avalanche can become separated from the bulk of the avalanche and travel a greater distance as a powder snow avalanche. Scientific studies using radar, following the 1999 Galtür avalanche disaster, confirmed suspicions that a saltation layer forms between the surface and the airborne components of an avalanche, which can also separate from the bulk of the avalanche.

Driving a non-airborne avalanche is the component of the avalanche's weight parallel to the slope; as the avalanche progresses any unstable snow in its path will tend to become incorporated, so increasing the overall weight. This force will increase as the steepness of the slope increases, and diminish as the slope flattens. Resisting this are a number of components that are thought to interact with each other: the friction between the avalanche and the surface beneath; friction between the air and snow within the fluid; fluid-dynamic drag at the leading edge of the avalanche; shear resistance between the avalanche and the air through which it is passing, and shear resistance between the fragments within the avalanche itself. An avalanche will continue to accelerate until the resistance exceeds the forward force.

There are several ways to prevent avalanches and lessen their power and destruction. They are employed in areas where avalanches pose a significant threat to people, such as ski resorts and mountain towns, roads and railways. Explosives are used extensively to prevent avalanches, especially at ski resorts where other methods are often impractical. Explosive charges are used to trigger small avalanches before enough snow can build up to cause a large avalanche. Snow fences and light walls can be used to direct the placement of snow. Snow builds up around the fence, especially the side that faces the prevailing winds. Downwind of the fence, snow buildup is lessened. This is caused by the loss of snow at the fence that would have been deposited and the pickup of the snow that is already there by the wind, which was depleted of snow at the fence. When there is a sufficient density of trees, they can greatly reduce the strength of avalanches. They hold snow in place and when there is an avalanche, the impact of the snow against the trees slows it down. Trees can either be planted or they can be conserved, such as in the building of a ski resort, to reduce the strength of avalanches.

Artificial barriers can be very effective in reducing avalanche damage. There are several types. One kind of barrier (snow net) uses a net strung between poles that are anchored by guy wires in addition to their foundations. These barriers are similar to those used for rockslides. Another type of barrier is a rigid fence like structure (snow fence) and may be constructed of steel, wood or pre-stressed concrete. They usually have gaps between

the beams and are built perpendicular to the slope, with reinforcing beams on the downhill side. Rigid barriers are often considered unsightly, especially when many rows must be built. They are also expensive and vulnerable to damage from falling rocks in the warmer months. Finally, there are barriers that stop or deflect avalanches with their weight and strength. These barriers are made out of concrete, rocks or earth. They are usually placed right above the structure, road or railway that they are trying to protect, although they can also be used to channel avalanches into other barriers. Occasionally, earth mounds are placed in the avalanche's path to slow it down.

参考译文

通常发生的雪崩有如下几种类型。松散型：在陡峭的悬崖上，当积雪场重量超过内部所能承受的压力时，通常发生此类型雪崩。新下的松散的雪所释放的力量达到一定的点，慢慢的蔓延在陡坡上，更多的雪揉合进来，形成泪珠状物。与此相异的是板型。与雪崩有关的天灾中90%是由此类型雪崩造成的，它极易发生在一层力量强大的板型雪盖成型之时。在避风处由风汇集而来的雪形成一定的高度，称为板型雪盖。当其塌陷时，下面脆弱的雪层，一层层的快速累积，汇成一大片，大约百米宽、几米深的雪崩顷刻间汹涌开来。第三种为融雪型。当积雪场被水浸透，积雪就开始蠢蠢欲动，快速地从一点展开。

沿着峭壁涌下的雪崩一路从积雪之顶揉进更多的雪，形成一定规模。这些雪团和空气混合在一起形成粉团状物。此种类型被称为粉团型。粉团状物是一团喧嚣狂暴、躁动不安地涌动着的雪流。粉团型雪崩是规模最大的雪崩，重量超过10,000,000吨，时速达300km/h。

所有类型的雪崩都是由于负担过重的雪层引起的，尤其是积雪场，它规模宏大，极其不稳定，并且超过了所能支撑它的悬崖的支撑力量。确定悬崖所能承受的重压和引起雪崩的临界点是一项复杂的需要考虑多种因素的工作。

平度超过25°，斜度超过60°的斜坡是典型的不易发生雪崩的地方。雪在陡坡上不会大量的堆积，在平坡上也不易滑动。当雪团所在的角度为35°到45°之间时人为引发的雪崩发生率会很大。38°是最有可能发生人为雪崩的角度。所以，第一准则是：不管所处角度如何，足够平坦则雪不易滑动，足够陡峭适宜滑雪的斜坡也有可能发生雪崩。需补充说明的是，雪崩发生的风险率与斜坡的使用有关。也就是说，愈多的滑雪者从该斜坡滑过，发生雪崩的几率就愈大。

四种影响积雪场的形成与发展的变量是：温度、下冲力、太阳辐射和风。北半球的中纬度区，在北向和东北向的阴暗的斜坡上发生的雪崩次数更多。然而，此地用于娱乐的场地，其使用率的攀升是能合理解释人为雪崩造成的原因。这与特定朝向的堵坡上发生的雪崩造成的灾难没有什么区别。向南的峭壁上的积雪场受阳光的照射，每天雪的消融和冻结的循环往复生成了一层坚硬的外壳，包裹着并不结实的积雪场，企图使其牢固。然而，这层外壳一旦破裂，将和底层的积雪分裂开来，脱落，并促成雪崩的形成。在山脊下面的斜坡上或是因为风的阻碍会积累更多的雪，更有可能积累很深的雪层，有更多受阻的风和雪檐，一旦触动这些将会爆发雪崩。



凸出的斜坡比凹进去的更危险。雪层所能延伸的力量和受压的力量不一致是造成凸斜坡雪崩危险性增加的主要因素。

另外一个影响雪崩的因素是雪下面土壤的性质。全深度雪崩(此型雪崩横扫积雪的斜坡，不留雪迹)在有着平坦的地面如草坪或石板的斜坡上发生更常见。植被在固定积雪场中起着重要的作用。在一定的情况下，石块和植被事实上将不能承受雪重量的地方深深地嵌入积雪场中。

有几种阻止和消减雪崩力量和破坏性的方式。它们应用于受雪崩之灾严重的地区：滑雪胜地、山区小镇、公路和铁路。爆破广泛用于阻止雪崩，特别是在其他一些方式不太实用的滑雪胜地。这种方法通常是在当积雪达到一定的厚度，并有可能导致雪崩的时候采用。雪墙和轻型墙体可以用来给雪导向。雪向周围特别是风势强的一边聚集。在雪墙的顺风边，雪很少积累得起来。这些起到使雪在篱笆边堆积的作用。它们原本会在那里堆积成山。风不断地扬起雪使其不至于汇聚成顶，从而使它慢慢地在篱笆边消融。如果此处的树林密度足够大，就可以显著地缓解雪崩的强度。雪崩爆发时，它们把雪团困在林地，雪对树的压力减缓了其速度。特别是在滑雪胜地的建筑物边，既可以种植树木也可以留有树林来消减雪崩之力。

人工障碍物可以非常有效地减少雪崩带来的损失。有几种类型如下：雪网。即是在杆子之间连起网线，在底端用牢固的线将其固定住。这些障碍物和其作用于岩滑堆的机理相似。另外一种障碍物是雪墙：一堵由铁片，木头或是预加应力的混凝土构成的墙。它们一般在横梁之间有空隙，垂直地修建在斜坡外围，并在斜坡的山底有加固的横梁。通常认为它们不太好看，特别是要修建多排时更是不美观。它们的建造费用昂贵，并且在温暖的季节，容易受到松动的飞石的攻击。最后是凭借自身的重量和力量阻止或使雪崩转向的障碍物。这样的障碍物由混凝土，石块和泥土构成。它们经常覆盖在建筑物、公路和铁路的表面起保护作用，但是它们也可以使雪崩转至其他的障碍物内。有时，在雪崩的轨道上修建土堤来减缓其速度。

核心词汇

avalanche ['ævəlɑ:nʃ] *n.* 雪崩
snowpack ['snəupæk] *n.* 以融雪水供灌溉，发电用的积雪场
entrain [in'trein] *vt.* 使乘火车
fracture ['fræktʃə] *n.* 破碎，骨折
propagate ['prɔpəgeit] *vt.* 繁殖，传播，传送
instantaneously [,instən'teinjəsli] *adv.* 即刻地，瞬间地
turbulent ['tə:bjulənt] *adj.* 狂暴的，吵闹的
particle ['pɑ:tikl] *n.* 粒子，点
massive ['mæsiv] *adj.* 巨大的
repose [ri'pəuz] *n.* 睡眠，静止
precipitation [pri,sipi'teiʃən] *n.* 坠落，沉淀
recreational [,rekri'eiʃənəl] *adj.* 休养的，娱乐的
thaw [θɔ:] *vt.* 使融解，暖和
unstable ['ʌn'steibl] *adj.* 不稳定的
ridge [ridʒ] *n.* 脊，山脊
boulder ['bəuldə] *n.* 大圆石
prevailing [pri'veiliŋ] *adj.* 盛行很广的，一般的
density ['densiti] *n.* 密度
rigid ['ridʒid] *adj.* 僵硬的，刻板的

History of Beach Erosion

19. 海滩侵蚀的历史

机经选粹

这一篇是讲海滩侵蚀的。现在沙滩上的沙变少了，每次飓风对城市的破坏就加大了。文中讲了沙子变少的原因和解决方法。



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History of Beach Erosion

Beach erosion is the act of either a human or weather factor that is either destroying or removing sand from a beach. Beach erosion occurs because of either humans or natural causes. As much as we would like to say that the environment is the main cause of our disappearing beaches, it's not, it's us.

Though the waves are the controllers of the speed that sand can be taken away, when we build property on beaches, dam up our rivers (which supply our sand), or put groins, we cover up a majority of the sand. Since we end up covering or taking away most of the sand, the small amount of sand that the original waves take away end up being the only sand left leaving only the bluff to be eroded. This causes our houses to be demolished, our sand to disappear and our beaches to be ruined.

We first discovered beach erosion when we started to build houses on the beach in the 1830's through 50's (Jordan). Scientists in the 1830's started to realize beach erosion but they didn't do much until the 1960's (Nieson). Residents of beach areas started to discover some of their beach was disappearing. When communities started to do something about these local problems, most of the permanent damage was already done.

We affect beach erosion largely because of our beloved beachfront *houses*. They

erode the bluffs that they stand on. Many beach property owners have bought land on a bluff or beach only to find that in a year, their backyards have become eroded and seemed to have disappeared. Houses on bluffs are especially prone to erosion. Surely many people have seen pictures of houses sliding down off their beachfront perch on a bluff into the hungry ocean below. Some people have attempted to save their homes with sea walls and rock walls, but unfortunately, their favorite kind is cement. Therefore, the waves are crashing against the wall instead of the beach, and because the wall is not sediment, no sand is being deposited with the worn down wall. So we can see that beach property owners play a large part in beach erosion.

Also, the plans that we have created to help beach erosion have back fired:

Breakwaters: Rock walls on the beach that break waves. They ended up trapping sand instead of decreasing the impact of the waves.

Sea walls: Sea walls hold up the bluff that was eroded by the waves. They ended up keeping the waves from depositing any sand.

Groins: Groins are similar to jetties and were intend to lessen the powerful currents that were attacking the beaches. Instead they trapped sand.

Submerged breakwaters: Submerged breakwaters are the same as a breakwater but in the ocean, trying to stop the impact of the waves before they even crashed onto the sand. They ended up trapping sand also, and surfers surfboards got caught in them.

In addition, dams and docks were created to help alleviate erosion problems, but have instead altered water flow, creating uneven sand deposits. In Southern California, more than 1.5 million cubic yards of sand are trapped behind dams a year. The damming of rivers reduces one half of the sand coming to the Santa Barbara beaches.

Storms, such as typhoons, hurricanes, and El Nino affect it with raging gales and pelting rain . At Stinson Beach in California, a few years ago when El Nino hit hard, it took us years to regain all that sand that the storms took away. For a while all you could see was sandstone.

Rivers can be misguided when earthquakes shift their paths, or when storms overflow them. This causes them to take the sand off its normal course not allowing them to replenish the beaches in later years. We also cause rivers to disappear by covering them up with our beach houses and damming them.

Global Warming is also a large problem. While it causes a rising sea level, it eats

away at the sand in its way. "The thermal expansion of the ocean and melting of glaciers cause this," says Robert Hanley, a reporter from the *New York Times*. In other words, the water level increases because of Global Warming and greenhouse gasses literally expands the water from just the heat and the melting glaciers around the world.

How It Affects Humans

Beach erosion affects humans by having the waves crash up on the sand, taking away a majority of the sand leaving only sediment in it's place. Since the bluff is the only thing left after the sand the waves start making the bluff disappear, therefore destroying the houses that are up on the bluff. We can repair the beaches by bringing sand to them, but this costs over $1 million per mile. The US is currently spending time and money ($150 million per year) to help repair beaches. Since so many people are wanting to live near the beaches, it's helping speed up the erosion problem. New Orleans is now several feet below sea level and facing possible annihilation. Island Nations across the Pacific Ocean could eventually disappear beneath the waves (Grant).

Humans are also creating more beach erosion by building houses on the bluffs of the beach, when the bluff is eroded the houses are ruined and the debris ends up hurting the environment. We make more houses every year, and anually they are lost due to beach erosion. Despite the fact that they are being destroyed, we keep making them because we can. Since we have the money, and we are oblivious to the problems with the beaches, it doesn't matter to us what affects it has on the world. We make houses, the waves tear them down, we make them again, the waves tear them down again. It is a vicious cycle that can only end with the beaches being totally destroyed.

How It Affects the Environment

Beach erosion is hugely effecting the environment because the houses that are destroyed by the cliffs eroding, send debris into the water, which can kill the animals. Either by them eating the unhealthy debris or getting caught inside it. The waves are knocking back the sand, bringing the ocean more inland, destroying the beach environment. We are trying to stop/halt the erosion process, which is stealing our beaches, but nothing seems to be working.

How It Will Affect the Animals

The waves are crashing up against the rock walls which house all kinds of clams, mussels, and barnacles and killing them, not only by the force of the waves, but it is destroying the rock/sediment walls that they live in. The waves are destroying

the beaches, ruining the living area for lots of animals. Animals such as the Pacific Loggerhead turtle, which nests on California's beaches. It's not breeding very well because we are taking away the beaches it nests on. It's not only us, humans, that are destroying their lives, ghost crabs and raccoons are also eating the eggs. Also erosion and unusually high tides are becoming immense problems. Ghost crabs, fiddler crabs, and other small animals are being killed because the beaches are being destroyed. Also, it is the trash that we humans so carelessly throw away on the beaches. Animals like birds and fish are being killed by the waste we throw on the beaches either because we are ignorant, lazy, or just don't care. Either way, the birds are getting trapped and killed by fishing lines, pop-tops from soda cans, and from getting tangled in the plastic six-pack holders we created for our own convenience.

Fortunately, even though beach erosion is a major problem, it has many solutions.

One of these is Dredged Sand. This is a process in which the sand is deposited onto the beaches by humans. Unfortunately, it costs 150 million dollars a year.

We could also rebuild rivers and guide them to places with a lack of sand, hoping that they will push the sand back into place. Yet, this would take a long time to do, and many people, and there would always be the risk that they'd become misguided again.

Also are the options of Breakwaters, sea walls, groins, and submerged breakwaters, but they have flaws too; they trap as much sand as they are helping to deposit.

Lastly, we could stop all building on beaches. This would probably help a lot, but few people would be willing to give up their beachfront houses. Also, we only have 3.7 million dollars to stop the building, and the construction companies have 50.6 million dollars to continue.

Maybe, if we all work together, we can slow the process that is attempting to steal our beaches.

参考译文

海滩侵蚀是由人为或天气因素造成的，它们会毁坏沙滩或把沙子从海滩冲走。海滩侵蚀的发生既有人为因素也有自然因素。大多数情况下，我们都会说海滩不断消失的主要原因是环境，但事实并非如此，我们人类才是元凶。

虽然海浪控制着沙子被带走的速度，但是人类在海滩上建地产，在为我们提供河沙的

河上筑堤坝或建防波堤，结果使我们覆盖或运走了大部分的沙子，从而使最初被海浪带走的少量的沙子成为仅有的沙子，只留下陡岸经受侵蚀。最终导致我们的房屋坍塌，沙石消失，海滩尽毁。

19世纪30年代到50年代，当人类开始在海滩上建房的时候，才首次发现了海滩侵蚀(乔丹)。19世纪30年代的科学家们已经意识到海滩侵蚀现象的存在，但是直到20世纪60年代他们才有所行动(尼尔森)。海滩地区的居民开始发现他们的部分海滩正逐渐消失。而当公众开始着手解决这些地方性问题的时候，大部分的永久性损害已经造成了。

人类在很大程度上影响了海滩侵蚀，因为我们钟爱靠海滨的房子。这些房子侵蚀了它们伫立的陡岸。很多海滩物业业主在陡岸或海滩上买地，结果却发现，在一年内，他们的后院就遭到侵蚀，似乎已经消失了。陡岸上的房子特别容易受到侵蚀。肯定有很多人都看到过这样的照片：陡岸上的房子从海滩边的高处滑向下面可以吞噬一切的海洋。有些人曾试图建防波堤和岩石墙来挽救他们的家园，但不幸的是，他们最喜爱的材料是水泥。因此，海浪撞毁的是墙而不是海滩，因为墙不是沉积物，没有沙石会沿着已经磨损的墙面沉积。因此，我们可以看出，海滩物业业主对海滩侵蚀有很大影响。

此外，建立水坝和码头是为了帮助缓和侵蚀问题，但它们却改变了水流量，造成不均匀的沙石沉积。在南加利福尼亚，每年有超过150万立方码的沙石被困在水坝后方。该河流堤坝使到达圣巴巴拉海滩的沙石减少了一半。

暴风雨如台风、飓风和厄尔尼诺现象，以其肆虐的狂风暴雨影响着海滩侵蚀。几年前，厄尔尼诺现象严重袭击了加利福尼亚州的斯廷森海滩，人们花了好几年时间才重新得到被风暴带走的沙子。有段时间能在海滩上见到的只有沙岩。

当地震改变了河流的路径，或暴风雨使河水泛滥时，会导致河流把沙子引离其正常轨道，使它们在接下来的几年里不能补充海滩沙量。我们也会因填河建海滨房屋和筑坝从而致使河流的消失。

全球变暖也是一个大问题。它使海平面上升，并以自己的方式吞噬着沙子。《纽约时报》的记者罗伯特·汉利说：“海洋上升暖气流的扩散和冰川融化导致了这种现象。”换句话说，水平面的上升是因为全球变暖和温室气体直接导致了世界范围内的气温升高和冰山的融化。

海滩侵蚀影响了人类，因为海浪撞击沙石，带走了大部分沙子，在原来的地方只留下了沉积物。陡岸是继沙子之后剩下来的唯一东西，而海浪开始使陡岸消失，从而毁坏伫立其上的房屋。我们可以通过引入沙子来修复海滩，但是每英里要花费100万美元。美国正在投入时间和资金(每年15,000万美元)以帮助修复海滩。很多人都希望在海滩附近居住，因此这会加快海滩侵蚀的速度。新奥尔良现在低于海平面几英尺，面临着可能毁灭的危险。横跨太平洋的海岛国家可能最终会消失于海浪之下(格兰特)。

幸运的是，虽然海滩侵蚀是一个很大的问题，但仍然有很多解决方法。

其中一个是捞取海沙。这是一个用人力将沙子堆积在海滩的过程。不幸的是，每年要花费1.5亿美元。

我们也可以重建河流，并把河流疏导至缺少沙子的地方，希望它们能将沙子冲回原

地。不过，这需要很长时间和很多人力，而且会一直存在风险，因为这些河流可能会再次受到误导。

建立防浪堤、海堤、防波堤和水下防波堤也是一种选择，但是也存在缺点：这些堤坝在帮助沉积沙子的同时，也会堵塞同样多的沙子。

最后，我们可以停止海滩上的所有建筑行为。这可能会有很大的帮助，但很少有人会愿意放弃他们海滨的房子。而且，我们只有370万美元去阻止那些建设工程，而建筑公司却有5,060万美元来继续他们的工作。

如果我们一起努力，或许能减慢海滩沙子的流失。

核心词汇

destroy [dis'trɔi] *vt.* 破坏，毁坏
environment [in'vaiərənmənt] *n.* 环境
demolish [di'mɔliʃ] *vt.* 粉碎，毁坏
permanent ['pə:mənənt] *adj.* 永久的，固定的
beachfront ['bi:tʃ.frʌnt] *n.* 海滨地区
bluff [blʌf] *n.* 陡岸，绝壁
cement [si'ment] *n.* 水泥
erosion [i'rəuʒən] *n.* 侵蚀
alleviate [ə'li:vieit] *vt.* 减轻，使缓和
cubic ['kju:bik] *adj.* 立方体的
storm [stɔ:m] *n.* 暴风雨
earthquake ['ə:θkweik] *n.* 地震
dam [dæm] *vt.* 筑坝
glacier ['glæsjə] *n.* 冰河
sediment ['sedimənt] *n.* 沉淀物，沉积
eventually [i'ventjuəli] *adv.* 终于，最后
deposit [di'pɔzit] *vt.* 沉积，存放
submerge [səb'mə:dʒ] *vt.* 使浸水，淹没
process [prə'ses] *n.* 过程，进程

Should There Be a Constitutional Guarantee of the Right to Housing?

20. 居住权需要宪法保障吗？

机经选粹

这一篇是讲工作环境和居住环境的，空间是人的权利大小的象征。

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Should There Be a Constitutional Guarantee of the Right to Housing?

That is one of the questions raised by the Rae government's proposal for a social charter in the latest round of constitutional discussions.

Rae himself is on the record as favoring such a proposal.

But what would it mean for people who rent?

For most of us, not all that much. There are already a number of ways tenants' rights are protected in Ontario, chief among them of course, *the Landlord and Tenant Act.*

But for the very poorest in our city, the homeless and those who live in hostels and rooming houses, such a guarantee could mean that they would be able to argue

their constitutional right to decent and affordable housing.

It would also give some teeth to organizations such as the Centre for Equality Rights in Accommodation (CERA), which agitate on behalf of the poorest.

Maintain Standards

For example, rooming house tenants could take the city to court over its failure to maintain the standards set down in its own bylaws.

In theory they can do that already, but with the Constitution at their backs, such groups would have a much better chance of winning.

Canada, along with 97 other countries, is a signatory to a 1966 United Nations treaty that requires nations to recognize the right of everyone to an adequate standard of living including adequate food, clothing and housing, and to the continuous improvement of living conditions.

The nations ratifying this covenant agree they will take appropriate steps to ensure the realization of this right.

It will be documents like this one that Rae refers to in his argument for a social charter.

David Hulchanski, a professor in the faculty of social work at U of T, points to the Netherlands example, where the right to housing is enshrined in the constitution and there is a definition of a minimum "adequate" standard.

That is not to say that everyone in the Netherlands has achieved an adequate standard; many have not.

But having "adequate" defined gives governments a target to shoot for and it gives society a way of measuring their politicians' progress towards that goal. Hulchanski argues that people who don't have adequate housing need a way to bring pressure on governments. But the very poorest in our society do not have the same access to the levers of power.

"The basic question is, is housing fundamental to human wellbeing or not?" says Hulchanski.

If you say that it is, then our housing system should function in such a way as to see that everyone has adequate housing; not a mansion, not necessarily home ownership even, but they should have it. If our housing system isn't functioning that way, people should have a recourse through the courts.



"It doesn't mean we can solve it quickly. Nobody can expect to bring a suit against the federal government saying, 'by next year you have to provide 300,000 units of housing.' But it does put it on the agenda for making measurable progress."

"If ordinary people can use the courts to pressure the government into doing something it's not doing in order to achieve something that is fundamental, great. We don't want the courts making our laws, but we do want our laws and our courts to protect basic human rights."

But what does the "right to housing" mean? In the Netherlands, where personal living space is at a premium, the definition of adequate housing relates to the number of square metres of floor space you occupy.

Here, space is not nearly as much of a problem. The definition of "adequate" would probably have more to do with the over-all maintenance of the building, whether there was proper heating in wintertime, fire hazards and policing, affordability and protection from eviction.

Hulchanski argues there is nothing difficult or complicated about defining adequate housing or the right to housing. What is lacking is the political will to address the issue.

In the current debate, the federal government seems to be more concerned with the property rights of owners than the human rights of dwellers—this is the subject of next week's column.

In the federal discussion paper, *Shaping Canada's Future Together*, the government says the *Canadian Charter of Rights and Freedoms* should be amended to guarantee property rights.

Politicians are loathe to take on any more responsibility for social welfare.

Conservatives argue that future governments will not have the flexibility to make economic decisions if they are constitutionally bound by obligations such as adequate housing for all.

It will be interesting to see how hard Rae pushes for his social charter and what, if any, progress he makes.

Debris Shower

In response to a recent column on neighbors, I received a letter from a couple who have lived in their apartment for 18 years and have recently been experiencing a shower of debris from the people upstairs who shake their rugs and tablecloths

over the balcony rail.

They have tried talking to the neighbors, the building management and the local health authorities, all in vain. It's a frustrating situation.

People do this kind of thing out of carelessness or thoughtlessness, not malice.

When confronted, however, things can quickly turn hostile. You should be very careful about such confrontations.

Under Section 109-C of the Landlord and Tenant Act it is the management's responsibility to curb this kind of behavior by tenants. But the problem needs to be brought to management in writing.

Another step you might take is to post a notice in the laundry room, or better still, photocopy it and hand-deliver it to the door of every apartment above you in the building.

Your appeal should be polite in tone, asking for neighborly consideration.



这是在最后一轮宪法讨论会上雷政府就建立社会宪章的计划所提出的问题。

雷本人很赞成这一提议。

但是，这对那些租客们意味着什么呢?

对于我们大多数人来说，影响不会太大。在安大略省，政府通过多种途径来保障租客的权利，当然其中最主要的一个是《业主与租客法令》。

可是对城市中穷困潦倒、无家可归或蜗居在旅店和客栈中的那些人来说，这样一个保障就意味着他们将拥有获得体面经济房的宪法权利。

同时也赋予了像“租客平权中心”这样的组织一定的权利。“租客平权中心”代表着特困人口的权益。

维持住房标准

比如说，如果住房条件并没有达到地方法规中的规定，客栈租客可将市政厅告上法庭。

理论上说，他们老早就能这么做了，但是，如果有宪法保障的话，他们就有更大的胜算了。

1966年，加拿大同其他的97个国家一同签署了一项联合国条约。条约要求各国“承认人人有权获得适宜的生活水准，包括足够的食物、衣物和住房以及不断改善的生活条件。”

各缔约国将采取适当的措施确保实现这一权利。

雷在对社会宪章的论述中引用了类似的文件。

多伦多大学社会工作学系的大卫·贺卓斯基教授以荷兰为例来说明住房问题。在荷兰，宪法保障居民的居住权而且规定了住房最低的“适宜”标准。

这并不是说荷兰的每个人都达到了适宜的住房标准，还有很多人没有达到。

但是有了明确的“适宜”标准，政府就有了前进的目标，而且让公众可以根据这个目标来衡量政客们的政绩。贺卓斯基认为那些没有得到适宜住房的人们需要给政府施压。但是社会中的特困人口却无法公平地获得各种权利。

贺卓斯基说：“根本的问题是，住房是不是人类幸福的基础呢？”

“如果回答是肯定的，那么我们的住房系统就应该使每个人都有合适的住房，而不是宅邸，甚至不必要有房屋所有权，公民就应该拥有住房。一旦住房系统没有承担起这样的角色，公民可以向法院提出诉讼以求帮助。”

“这不是说我们可以很快地解决这个问题。毕竟没有人能够将联邦政府告上法庭，要求‘到明年为止，政府必须提供三十万套住房’。但是我们将它提上日程，希望有所改善。”

“如果普通民众能够通过法院向政府施压，迫使政府采取措施从而获得基本保障，那是最好不过的了。我们并不指望法院为我们制定什么法律，我们只是希望法律法规和法院能够保障基本人权。”

但是，“居住权”到底是什么意思呢？在荷兰，个人居住空间非常宝贵，因此“适宜住房”的定义与个人居住面积大小相关。

在加拿大，空间几乎不是什么大问题。“适宜”的定义可能就更多地涉及建筑物的全面维修，冬天是否供热，是否配备有火险和报警设备，价钱是否合适以及是否有被驱赶的危险。

贺卓斯基认为定义“适宜住房”和“居住权”并不困难也不复杂，缺少的只是政府是否重视这一问题。

在目前的讨论中，联邦政府似乎更加关心业主的财产权，而不是居民的人权——这是下个星期我们在专栏中要讨论的。

一份名为《共同构建加拿大的未来》的联邦政府讨论文件指出，政府应修订《加拿大权利与自由宪章》来保障财产权。

政客们对为社会福利承担更多的责任极为反感。

保守党人士辩解说，如果政府从宪法上被为全民提供适宜住房的义务束缚了的话，那他们将来就不能灵活地作出经济决策。

雷是如何促成他的社会宪章的，而且如果他使情况有所改善的话又会有什么改善呢？这可能会很有意思。

垃圾雨

我收到了一对夫妇对最近一期关于邻居的专栏文章的反馈信。这对夫妇在他们的公寓里已经住了18年了，但近段时间以来，他们不断遭受“垃圾雨”的袭击，楼上的邻居经常在阳台围栏外抖毛毯和桌布上的灰尘。

他们尝试与邻居进行沟通，并向大厦管理处和当地卫生主管部门投诉，但徒劳无功。

真是令人沮丧！

做这种事情的人们通常是因为粗心和欠考虑，并没有恶意。

然而当面对质，事情会很快恶化，形成敌对局面。我们大家都要非常谨慎地对待这种对峙。

按照《业主与租客法令》第109条(C)规定，阻止租客类似的行为是物业管理部门的责任。但是要以书面形式向管理部门提交问题。

你还可以在洗衣房张贴告示，或者有个更好的主意：影印告示然后分发给楼上的每位住户。

语气要谦恭有礼，表现出你恳切希望邻居之间能够相互理解。

核心词汇

charter ['tʃɑːtə] *n.* 宪章

constitutional [ˌkɔnsti'tjuːʃənəl] *adj.* 符合宪法的，立宪的

tenant ['tenənt] *n.* 租客，房客

guarantee [ˌgærən'tiː] *n.* 保证，担保

agitate ['ædʒiteit] *vt.* 使……摇动，鼓动，煽动

signatory ['signətəri] *n.* 签署者，签名人

ratify ['rætifai] *n.* 批准，认可

enshrine [in'ʃrain] *vi.* 铭记

measurable ['meʒərəbl] *adj.* 可测量的，恰当的，适度的

wintertime ['wintətaim] *n.* 冬季

eviction [i(ː)'vikʃən] *n.* 逐出，赶出

loathe [ləuð] *vi.* 厌恶，憎恶

debris ['debriː] *n.* 碎片，残骸

balcony ['bælkəni] *n.* 阳台，露台

neighborly ['neibəli] *adj.* 睦邻的，友好的

第五章
其他

The Story of Glass

1. 玻璃的故事

机经选粹

这一篇讲的是玻璃的产生过程、制作方法（与现代玻璃制作方法的比较）和商业应用。

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The Story of Glass

Some 2000 years ago, a group of Phoenician merchants used blocks of "natron", an alkali, to support their cooking pots over the fire while preparing dinner. When the fire burned out, they discovered a clear residue. This has been credited with being the first human-made glass.

The story has a nice imaginative appeal. However, it would not have been possible for the heat from the fire to fuse natron and sand into a glass-like substance. This would have required a temperature over 1100 degrees centigrade. What likely happened is that the sand in the region was, in fact, powdered obsidian—natural glass. It would then have been possible for the heat from the fire, assisted by the fluxing action of the natron on the sandy particles, to produce a glass residue.

Glass containers for food, beverages, cosmetics and medicines have been with us a long time. Human-made glass is thought to be the oldest manufactured substance in the world. Archaeologists have found glass bottles and jars dating back to 1500 B.C.

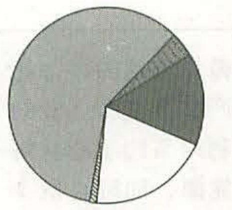
Since then, glassmaking has had a long and fascinating development, right up to its present multitude of uses by artisans, craftspeople and manufacturing firms.

How Container Glass Is Made

Container glass is made of simple, natural ingredients: silica sand, soda ash and limestone. These materials are mined all over North America and there is a plentiful supply available. The following chart illustrates the basic list of ingredients for container glass.

A variable percentage of recycled glass (cullet) can be added to the raw materials to reduce the amount of virgin raw materials used. The variable percentage is based on the consistency of supply and quality. The use of recycled glass conserves raw materials, and

the energy used to make glass, while at the same time reducing solid waste.



Glass Colour

Container glass can be made in many different colours, with the most common colours being flint (clear); amber or brown, produced by the addition of iron-sulphide; various shades of green, produced by adding iron-chromite, and light blue, produced with cobalt. These are shown in the pie chart as minor ingredients.

Different colours can serve a specific function for the companies which fill the glass containers with foods, beverages and other products. One colour might be chosen for marketing purposes, while another is used for technical reasons. For example, amber glass used by the brewery industry protects the contents against damage by ultraviolet light.

Glass Container Manufacturing

The glass container manufacturing process begins when raw materials are received and stored in silos. These materials are then transferred through a gravity feed system to a weigher and mixer, where the materials are mixed with cullet (recycled glass) to ensure a homogeneous melting. The mixture is conveyed to a batch storage bin where it is held until dropped into the feeder to the melting furnace.

The furnace most commonly used is a continuous regenerative furnace capable of producing between 90 and 360 tonnes of glass per day. As the glass melts at 1500 degrees centigrade, it passes to the front of the furnace, eventually flowing through a throat to the refiner. In the refiner, the molten glass is heat conditioned for delivery to the forming process.

After refining, the molten glass is channeled through forehearths and delivered to the forming machines. There, the glass is cut into sections (gobs) by a set of mechanical shears and formed using blank and blow moulds. Once the glass is shaped into a container, it is fed to a lehr oven for annealing, which removes unwanted stress areas in the glass. Then it is inspected and prepared for shipment to market. Any damaged or defective glass is transferred back to the batch plant to be used as cullet.

Recycled Glass in New Production

Only container glass can be used to make new containers. The reason is that, although most glass is made from silica sand, soda ash and limestone, container glass has a distinct and different formulation. Window glass, drinking glass, crystal or laboratory glass, if put in for recycling, will cause quality problems for the glass container industries using recycled glass.

The amount of recycled glass used by Consumers Glass in its glass containers increased each year since 1988, when it stood at 7%, to a high of 34% in 1994. In 1995, less recycled glass meeting Consumers requirements was available and a 31% recycled content was achieved.

参考译文

大约2000年前，一群腓尼基商人在准备晚餐时，利用天然碳酸钠块和碱来支撑火上的饭锅。当火熄灭后，他们发现了一种透明的残渣，这就是第一块人造玻璃。

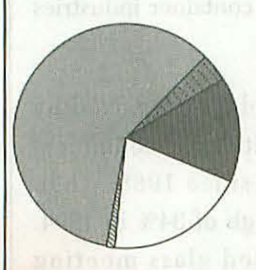
这个故事让人们有很大的想象空间。然而，火所散发出的热量是不可能把碳酸钠和沙熔化从而形成一种玻璃状物质的。要做到这点需要1100摄氏度以上的高温。事实上，可能的情况是那个地区的沙子是粉末状的黑曜石——一种天然玻璃。这样，火散发出的热量，加上沙粒上的碳酸钠被熔化，才有可能产生玻璃残渣。

我们已经用玻璃容器盛装食物、饮料、化妆品和药品很长时间了。人造玻璃被认为是世界上最古老的创造发明。考古学家已经发现了公元前1500年的玻璃瓶和玻璃罐。

从那以后，玻璃的制造就开始了它漫长而充满魅力的发展过程，直至今日，它已被工匠、手艺人和生产公司广泛使用。

怎样制作容器玻璃

容器玻璃是用简单、天然的原料制作而成的，包括：石英砂、纯碱和石灰石。整个北美都富含这些原料而且货源充足。下面这个图表罗列了容器玻璃的基本原料：



- 石英砂（60%）
- 无水碳酸钠（20%）
- 石灰石（15%）
- 氧化铝-硅酸盐（4%）
- 芒硝（0.9%）
- 微量成分（0.1%）

将可再循环使用的玻璃(废碎玻璃)以不同的比例加入到原材料中，来减少原始原料的使用量。再循环玻璃的添加比例取决于原料供应和产品质量相一致的状况。再循环玻璃的利用节约了原材料和制作玻璃所使用的能源，同时也减少了固体垃圾。

玻璃的颜色

容器玻璃可以制作成多种不同颜色，最常见的就是紫褐色(透明的)，黄褐色或棕色是通过添加黄铁矿制成的，各种不同色度的绿色是通过添加铬铁矿制成的；还有浅蓝色是通过添加钴制成的。在上面的圆形分析图里这些物质被列入微量成分。

对于用玻璃容器盛装食物、饮料和其他产品的公司来说，不同颜色的玻璃容器有不同的功能。他们可能会出于营销目的而选用一种颜色，有时也可能出于技术考虑而选择另一种颜色。比如说，酿酒工业就使用黄褐色玻璃瓶来防止酒的成分遭到紫外线的破坏。

玻璃容器制造

从收到原材料并储存在筒仓的那刻起，玻璃容器的制作程序就开始了。这些材料通过一个重力自流进料系统被转移到称量搅拌器中，在这里，原材料和废碎玻璃(再循环玻璃)被混合在一起，以确保同质熔化。然后，将混合物运送到搅拌贮仓里存放，然后倒入进料器，直到送入熔炉为止。

最常用的熔炉是一种日产玻璃90至360吨的蓄热式连续加热炉。当玻璃被1500摄氏度的高温熔化之后，它通过熔炉的前端，流过一节颈管最终到达精炼机。在精炼机里，熔化了的玻璃被加热，为下一步的成型工序创造好条件。

精炼之后，液态玻璃通过管道流过前炉，被运送到成型机里。在那里，玻璃被

一套机械剪切机切割成一节一节(块)的，并通过雏形吹塑模具吹制成型。一旦玻璃被制成容器模样，它就被放入退火炉退火，除去玻璃内部不必要的压力。然后检查这些玻璃器具，为装船入市做好准备。任何破损的或有缺陷的玻璃都被送回，用作废碎玻璃下次使用。

新生产过程中的再循环玻璃

只有容器玻璃才能被用来制作新的容器。原因是，虽然大部分玻璃都是由石英砂、纯碱和石灰石制成的，但容器玻璃有一种独特的与众不同的配方。如果窗玻璃、酒瓶玻璃、水晶玻璃和实验室玻璃被用于再循环生产中，将会给以再循环玻璃为主要原材料的玻璃容器制造行业带来质量问题。

自从1988年以来，Consumers Glass公司在玻璃容器生产中利用的再循环玻璃数量逐年增多。1988年再循环玻璃占原料总量的7%，1994年上升到34%。1995年，满足Consumers要求的再循环玻璃的数量减少了，只占了31%。

核心词汇

Phoenician [fi'niʃiən] *adj.* 腓尼基的
natron ['neitrən] *n.* 天然碳酸钠
alkali ['ælkəlai] *n.* 碱
imaginative [i'mædʒinətiv] *adj.* 富于想象力的
centigrade ['sentigreid] *n.* 摄氏度
obsidian [ɔb'sidiən] *n.* 黑曜石
flux [flʌks] *vt.* 熔化，使融化
artisan [ɑ:ti'zæn] *n.* 工匠，技工
limestone ['laimstəun] *n.* 石灰石
recycle ['ri:'saikl] *vt.* 使再循环，再利用
consistency [kən'sistənsi] *n.* 一致性
flint [flint] *n.* 燧石，打火石
amber ['æmbə] *n.* 黄褐色，琥珀色
sulphide ['sʌlfaid] *n.* 硫化物
chromite ['krəumait] *n.* 亚铬酸盐，铬铁矿
cobalt [kə'bɔ:lt] *n.* 钴，钴类颜料
brewery ['bru:əri] *n.* 酿酒厂，啤酒厂
silo ['sailəu] *n.* 筒仓
cullet ['kʌlit] *n.* 碎玻璃
furnace ['fə:nis] *n.* 炉子，熔炉
regenerative [ri'dʒenərətiv] *adj.* 再生的，更生的

Fuel Cell

2. 燃料电池

机经选粹

本篇是讲一种燃料电池和其发电过程的。应该推广此种燃料。

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Fuel Cell

The fuel cell can trace its roots back to the 1800's. A Welsh born, Oxford educated barrister, who practiced patent law and also studied chemistry or "natural science" as it was known at the time, named Sir William Robert Grove realized that if electrolysis, using electricity, could split water into hydrogen and oxygen then the opposite would also be true. Combining hydrogen and oxygen, with the correct method, would produce electricity. To test his reasoning, Sir William Robert Grove built a device that would combine hydrogen and oxygen to produce electricity, the world's first gas battery, later renamed the fuel cell. His invention was a success, and Grove's work advanced the understanding of the idea of conservation of energy and reversibility. Interest in Grove's "gas battery" diminished as the dawn of cheap fossil fuels approached and the soon to be discovered steam engine captivated the present day society.

Fast-forwarding to the 1960's, a new government agency was about to undertake the first step in maturing fuel cell technology. The National Aeronautics and Space Administration (NASA) was developing the mission critical systems for the first prolonged manned flight into space. Once in space, the orbiter needed a source of electricity. Batteries were ruled out due to the size, weight and toxicity necessary to support a mission of eight days in space. Photovoltaics were not practical, at the time, due to the size and weight of the solar panels necessary. The once obscure fuel cell became the technological solution to NASA's dilemma of how to provide power for extended missions to space. The earlier problems of cost and fuel supplies that plagued fuel

cells became irrelevant as the spacecraft was already carrying liquid hydrogen and oxygen. An additional benefit of fuel cells over other technology was that the astronauts could consume the fuel cell's water by-product. On the early missions powered by fuel cells, there were problems with the systems that required attention. On each subsequent mission the fuel cells became increasingly reliable and today NASA's space shuttle relies on fuel cells for electricity and drinking water once in orbit.

NASA and the space program provided fuel cells with the initial research and development the technology required. Since their adoption by the space program, fuel cell technology has achieved widespread recognition by industry and government as a clean energy source for the future. With this in mind, the amount of interest in fuel cells has expanded exponentially to where 8 of the 10 largest companies in the world are involved with fuel cells in some respect. Today, billions of dollars have been spent on research and the commercialization of fuel cell products. Over the next couple of years, the products that have been in the commercialization process will begin to be available to consumers.

What Is a Fuel Cell?

The easiest way to understand fuel cells is to think of them as a cousin to the ordinary battery. Both produce electricity through electrochemical reactions. The difference lies in a fuel cell's ability to constantly produce electricity as long as it has a source of fuel where a battery needs to be recharged. Consequently, since a fuel cell does not store energy internally, a fuel cell will not "run down" like a battery. Fuel cells directly convert the fuel into electricity where a battery has to replenish its electricity from an external source.

The fuels utilized by a fuel cell to generate electricity are hydrogen and oxygen. Hydrogen, the most abundant element on Earth, is rarely found in its pure form. Most fuel cell systems employ a component called a reformer to extract hydrogen from hydrogen rich fossil fuels. The by-products of this process are carbon dioxide, less than half the amount generated by traditional electricity generation methods, and trace amounts of nitrous oxide. The hydrogen purity requirement and the need for reforming are dependent on the type of fuel cell stack employed.

In order to provide an example of the electrochemical process that occurs in a fuel cell, the following describes the chemical reactions in a typical proton exchange membrane (PEM) fuel cell. Once the fuel has been reformed into hydrogen, the fuel cell combines oxygen, from the surrounding atmosphere, and hydrogen to generate electricity and water. The hydrogen is fed into the anode side of the cell where it encounters a catalyst. The catalyst strips the negatively charged electrons from the hydrogen, which are then routed out of the cell through an external circuit (i.e. light bulb, house, motor, etc...). The hydrogen ions (H+) travel through the electrolyte contained in the fuel cell until they reach the cathode. Once at the cathode, the hydrogen ion (H+), the electron that travelled through the external circuit and the oxygen molecule join together. The by-products of the electrochemical reaction

that occurs in a fuel cell are electricity, water vapor and heat. Theoretically, the water vapor can be recycled to produce additional hydrogen. The waste heat can be utilized for heating water, space heating and cooling. The direct conversion of fuel into electricity allows fuel cells to achieve substantially higher efficiencies than combustion, which is limited by Carnot's Law of Thermodynamics. Fuel cells achieve efficiencies of 35% to 90% depending on whether the waste heat is employed. These efficiencies are about 2 to 3 times higher than a combustion engine which converts fuel to heat, then into mechanical energy and finally into electricity. The final major component of a fuel cell system is the power conditioning equipment. This piece converts the low-voltage DC power produced by a fuel cell into high voltage AC power, which most household appliances operate on. Many fuel cell power-conditioning units employ batteries to handle peak demand loads that are beyond the fuel cell system's peak output. This can occur when multiple appliances are started at once. The power-conditioning unit also controls the electricity's frequency and maintains the harmonics to an acceptable level.

Through a single electrochemical process, a fuel cell produces electricity, water, and heat using fuel and oxygen in the air . Water is the only emission when hydrogen is the fuel. As hydrogen flows into the fuel cell on the anode side , a platinum catalyst facilitates the separation of the hydrogen gas into electrons and protons (hydrogen ions) in a proton exchange membrane or PEM fuel cell.

The hydrogen ions pass through the membrane and, again with the help of a platinum catalyst, combine with oxygen and electrons on the cathode side producing water. The electrons, which cannot pass through the membrane, flow from the anode to the cathode through an external circuit containing an electric load which consumes the power generated by the cell. The overall electrochemical process of a fuel cell is called "reverse hydrolysis," or the opposite of hydrolyzing water to form hydrogen and oxygen.

A reversible fuel cell can accomplish "hydrolysis" through the supply of electricity to the cell and a supply of water to the cathode. Only certain fuel cell types are reversible, that is, can also accomplish the electrochemistry associated with both the production of electricity from fuel and oxidant and the production of fuel and oxidant from water when supplied with electricity.

The Reversible fuel cell concept is one that incorporates a reversible fuel cell that can accomplish both hydrolysis and reverse hydrolysis in the same cell. This allows one to consider the completely renewable production of electricity by using a renewable energy supply (e.g., solar, wind) to produce hydrogen and oxygen from water which can subsequently be used to produce electricity through the same fuel cell from the fuel and oxidant produced previously.

Fuel Cell Benefits

Fuel Cell Environmental Benefits

High Fuel Efficiencies

By converting fuel directly into energy



through an electrochemical reaction, fuel cells extract more power out of the same quantity of fuel when compared to traditional combustion. This direct process results in a reduced amount of fuel being consumed and greater efficiencies, 30% to 90%, depending on the fuel cell system and if the surplus heat is utilized. Combustion-based energy generation first converts the fuel into heat, limited by Carnot's Law of Thermodynamics, and then into mechanical energy, which provides motion or drives a turbine to produce energy. The additional steps involved in combustion generation allow energy to escape as heat, friction and conversion losses, resulting in lower overall efficiencies.

Low Emissions

When hydrogen is the fuel; water, heat and electricity are the by-products of the electrochemical reaction in a fuel cell generating electricity, instead of carbon dioxide, nitrogen oxides, sulfur oxides and particulate matter inherent to fossil fuel combustion.

When fossil fuels are reformed into hydrogen, emissions of carbon dioxide, nitrous oxides, sulfur oxides and other pollutants are a fraction of those produced through the combustion of the same amount of fuel.

Reduction in Environmental Damage Inherent to Extractive Industries

Fuel cells avoid the environmental damage associated with the extraction of fossil fuels from the Earth when the hydrogen is produced from renewable sources. If a hydrogen spill occurred, it would evaporate instantly, because hydrogen is lighter than air, leaving only water behind. This a dramatic departure from the legacy that oil drilling, transportation, refining and waste products have left on the Earth.

Fuel Cell Engineering Benefits

Fuel Flexibility

Fuel cells are capable of operating on hydrogen, or hydrogen reformed from any of the common fossil fuels available today.

High Power Densities

The amount of power a fuel cell can generate within a given volume is usually given in kWh/liter. These numbers continue to rise as manufacturers continue research and development on their respective products.

Low Operating Temperatures and Pressures

Fuel cells operate at 80℃ to over 1,000℃, depending on the type of fuel cell. These numbers might seem high, but the temperature inside your vehicle's internal combustion engine can reach over 2,300℃.

Site Flexibility

Fuel cells, with their inherently quiet operation, zero to minimal emissions and reduced permitting requirements, can be located in a variety of areas, both residential and commercial, inside and outside.

Cogeneration Capability

When the waste heat from the fuel cell's electrochemical reaction is captured, it can be utilized for water, space heating and cooling. With cogeneration capabilities, the



efficiencies achieved by a fuel cell system approach 90%.

Quick Response to Load Variations

To receive additional energy from a fuel cell, more fuel is introduced into the system. Fuel cell load response is analogous to depressing the gas pedal in your vehicle, more fuel more power.

Engineering Simplicity

Fuel cells do not contain any moving parts. The lack of movement allows for a simpler design, higher reliability's, quite operation and a system that is less likely to fail.

Domestic Energy Security

The hydrogen fuel utilized in fuel cells can be domestically produced through coal gasification, reformed from natural gas, produced through the electrolysis of water or renewable sources such as photovoltaics or wind. A domestic energy supply reduces our foreign trade debt and decreases our dependence on foreign fuel supplies that are mainly located in politically unstable regions of the World.

The rapid consumption of fossil fuels that modern society requires for its standard of living is exhausting a finite resource. The supply of hydrogen, the most abundant element in the Universe, is unlimited. By beginning the transition to a Hydrogen Economy, society can avoid the turbulent conversion based on a shortage of oil while creating domestic energy security and inventing a huge industry.

Independence from the Power Grid

A residential fuel cell system allows people to become independent of the brown outs, power failures and voltage irregularities that are commonplace when connected to the utility grid. Any one of these common power disruptions can damage sensitive computer systems, electronic equipment and the quality of life people desire to have. Reliable energy in areas that are subjected to weather related power outages.

Fuel Cells vs. Traditional Batteries

Fuel cells offer a reduction in weight and come in a compact package for the same amount of available energy when compared to batteries.

To increase the power in a fuel cell, more fuel is introduced into the system. To increase the power of a battery, more batteries have to be added increasing the cost, weight and complexity of the system.

A fuel cell never "runs down", it continues to produce electricity as long as fuel is present. When a battery "runs down" it has to undergo a lengthy, inconvenient recharge time to replace the spent electricity. Depending on where the electricity originates, pollution, costs and efficiency problems are transferred from the batteries location to the central generating plant.

Fuel Cells: a Technology Coming of Age

The fuel cell has been in existence for over 160 years. In the 1830's, a Welch judge by the name of Sir William Robert Grove reversed the already well-understood chemistry principal of electrolysis and generated electricity. At the time, society was not intrigued with the fuel cell and had little grasp of the technology's potential.

It was around the same time that the internal combustion engine was developed in Germany and vast, seemingly limitless, reserves of petroleum were being discovered all over the globe. It was the beginning of the fossil fuel age, and a larger segment of society was enjoying a higher standard of living through the utilization of cheap energy and machines to do work. The nonexistent understanding of the detrimental effects of combusting fossil fuels and lower resource consumption rates fueled the excitement of the day. Grove's invention was little more than a curiosity as the internal combustion engine and petroleum enthralled the age.

Fossil fuels and the internal combustion engine reigned supreme from Grove's day up to the present day and they probably will into the near term future. Looming on the horizon is the day when society will run out of fossil fuels. Academics, pundits and experts argue over the exact timing of the depletion of our natural resources. The one fact that remains the same in every discussion of consumption rates and timelines is that fossil fuels are a finite resource, that means once they are gone they are extinct, forever lost. Most of the predictions concerning when we will eventually run out of fossil fuels use current consumption rates to forecast when the actual day will come. What is discounted is that current consumption rates are not a static number. These rates are constantly increasing as the developing world desires a higher standard of living and one component of a higher standard of living is increased energy use. Whether people adhere to a number of 5 years or 50 years, common sense indicates that the inevitable is exactly that, mankind will eventually run out of fossil fuels. This event will threaten energy prices and energy security. Well, the next question is what can society do to avoid the turmoil that would surround ever-increasing fuel prices as demand outstrips supply? The answer is hydrogen, and fuel cells are the first step in a smooth transition to a hydrogen-based economy.

Environmental Concerns

Hydrogen and fuel cells have been receiving a lot of attention in the popular press lately. Environmental concerns regarding society's energy use, centering on global warming and urban air pollution, have forced industry to look at alternatives to fossil fuels. In the United States, energy use is the largest single source of air pollution. Fuel cells and their reduced or nonexistent emissions are a solution for reducing the current levels of pollution associated with energy use. A reduction in the level of air pollution encapsulating many major metropolitan areas results in a decline of pollution related medical conditions and an improved quality of life for the areas' inhabitants.

Many state governments have taken the lead in environmental protection and reducing urban air pollution. California, Massachusetts, New York and Delaware have all enacted strict measures to reduce air pollution in their respective states. To achieve a reduction in air pollution, the states have mandated that car manufactures are required, as a percentage of total sales in their state, to sell a certain number of low or zero emission vehicles. The market created by

this legislation is estimated to be currently at 4 to 5 million cars a year. For vehicle manufacturers, this market is too lucrative and too large to ignore as many other states are considering similar environmental legislation.

Domestic Energy Security

The United States is extremely dependent on other, politically unstable and politically unfriendly, countries for its supply of oil. According to the US Department of Energy (DOE) reports, the United States imports more than 50% of its oil supply and this figure is expected to increase to 65% by 2020. The global demand for oil is increasing at 2% per year with global demand expecting to increase by 65% by 2020. The fuel flexibility characteristic inherent in fuel cells and the ability to produce hydrogen domestically would result in a decline in the dependence on foreign energy sources, greater national energy security, a reduction of the military forces now poised to defend our energy interests at a moments notice in the Persian Gulf and a decrease in foreign trade debt.

When most people think of oil, we think of gasoline and other fuels. Oil and its hydrocarbon products are intertwined with many things we take for granted today. Plastics, chemicals, fertilizers and many other common products are based on oil and its by-products. When utilizing a finite, rapidly shrinking resource the question becomes how can that resource best be utilized? The answer that comes to mind is; use it for the things where there is no other substitute. In terms of chemicals, fertilizers and others there is no substitute for oil as a raw material. Regarding energy, there are alternatives. These alternatives include renewables, with hydrogen as the energy carrier and storage medium, and domestically produced hydrogen from natural gas or off-peak electricity. The largest hurdle for hydrogen to overcome is a lack of infrastructure. This problem is by no means insurmountable with the proper investment by industry and government.

Deregulation of the Electric Industry

The utility industry in the United States is undergoing a radical change. An industry once dominated by monopolies, is now being transformed to allow for competition and customer choice. This deregulation allows consumers to choose how their electricity is being generated and what impact, as individuals, their energy use will have on the environment. Fuel cells offer the opportunity for greatly reduced emissions and increased efficiency, when fossil fuels are used to produce the hydrogen, or zero emissions and a completely renewable energy source when coupled with a renewable energy system generating the hydrogen.

Deregulation and fuel cells have opened the opportunity for distributed generation plants. Distributed generation is the industry term for generating electricity at the place where the electricity is to be used. Distributed generation avoids the enormous capital costs, underutilization of plant assets and transmission losses associated with a centralized distribution system that is the current model for the utility grid. Fuel cells are quiet, emit minimal to zero pollution, and avoid the site and permitting regulations that plague



traditional generation methods. For an energy services company, a fuel cell power plant is a practical method to cost effectively add environmentally friendly capacity where it is required.

Internationally, the demand for energy is expected to increase by 50% over the next ten years. Fuel cells and distributed generation will allow developing nations to under go the "cellular phenomenon" when structuring their utility grids. In many developing countries, phone lines are almost non-existent. Instead, cell towers have been erected and people communicate via cell phone. This allowed phone system operators to avoid the staggering cost of running a phone line to every residence and building. Fuel cells could have the same effect by allowing developing countries the opportunity to install smaller community and industrial based energy generation sites. This avoids many of the costs associated with establishing a large utility distribution and grid system (distributing hydrogen via pipeline has been estimated to be around 1/4 as expensive as transmitting an equal amount of energy in the form of electricity over transmission lines) in addition to the pollution associated with fossil fuel energy plants.

The Stock Market

Either through the recommendation of their financial advisor or featured on a nightly news program, fuel cell companies have been receiving a lot of attention lately from investors. Traditionally, the energy sector is a relatively stable sector that has not received much attention in the past. Now and in the near future, fuel cell companies are offering products that will revolutionize an industry that has not seen any major improvements in their technology or its industry structure (forthcoming deregulation) since the 1930's. Combine the forthcoming improvements in the utility industry with the recent announcements, by every major vehicle manufacturer, concerning fuel cell's ability to replace the internal combustion engine and fuel cell stocks have become some of the upwardly mobile stocks on the market.

Economic Growth

Fuel cells and hydrogen have the enormous ability to create many new jobs as society begins the transition to a Hydrogen Economy. New employment opportunities will abound as manufacturers require additional workers to fabricate, design and test fuel cell systems, components and other related services. Other areas revolving around hydrogen production, storage and other related products will create additional jobs. A DOE study concluded that by meeting the demand, in California alone, for zero emission vehicles with fuel cells, over 700,000 new jobs would be created in the fuel cell manufacturing industry. A study conducted by the Wisconsin Energy Bureau has found that three times as many jobs would be created in the state by investing in renewable energy instead of fossil fuels.

Conclusion

Fuel cells and hydrogen are riding some powerful historical trends. Throughout history, mankind's energy use has moved towards a higher hydrogen ratio in the chemical composition of the fuel and a reduction in

the other components. Starting with wood, then to coal, oil and natural gas, society's shift in type of fuel is simply a movement along a hydrocarbon chain. As the form of the fuel changed, more of the carbon, from which a significant percentage of the pollution associated with fossil fuels originates from, was eliminated. Hydrogen and fuel cells complete the process of eliminating the dirty carbon and finish the task of employing pure, clean hydrogen. Aside from history, fuel cells and hydrogen are riding the momentum created by an increased environmental awareness, the inevitable extinction of our fossil fuel reserves, sound economic policy and the optimism of the stock market.

参考译文

理解燃料电池最简单的方式是把它们看作普通电池的亲属。两者都是通过电化学反应产生电流。不同之处在于，只要燃料电池有一个燃料源，它就可以不断产生电流，而普通电池则需要再充电。因此，由于燃料电池内部没有储存能量，所以它就不会像普通电池一样"耗损"。燃料电池直接将燃料转换成电力，而普通电池必须要从外部电源充电。

燃料电池用来发电的燃料是氢气和氧气。氢是地球上最丰富的元素，但很少可以找到它的纯净形式。大部分燃料电池系统使用一个叫做转化炉的组件，从富含氢的化石燃料中提取氢。这个过程中产生的副产物是二氧化碳以及微量的一氧化二氮，其中二氧化碳的量还不到用传统发电方法所产生的二氧化碳的一半。氢气纯度的要求和转化的需求依赖于所用燃料电池堆的种类。

与传统的燃烧相比，燃料电池通过电化学反应将燃料直接转化为能源，从同等数量的燃料中提取出了更多的能量。如果余热被利用，这种直接的过程使得被消耗的燃料数量减少，而且效率更高，从30%上升至90%，这取决于燃料电池系统。以燃烧为基础的能量产生受卡诺的热力学定律限制，它首先将燃料转化成热量，然后转化成机械能，这种机械能提供机械运动或驱动涡轮机产生能量。燃烧发电的附加步骤让能量以热量、摩擦和转换的形式而流失，导致了整体效率低下。

当氢作为燃料时，在燃料电池发电过程中，电化学反应的副产品是水、热量和电力，而不是二氧化碳、氮氧化物、硫氧化物及化石燃料燃烧所固有的微粒物质。

当化石燃料被转化成氢气时，二氧化碳、氮氧化物、硫氧化物和其他污染物的排放量是同样数量的燃料燃烧时所产生的排放量的一小部分。

当氢是从可再生资源中产生时，燃料电池避免了从地球提取化石燃料所带来的对环境的破坏。如果发生氢泄漏，它会立即蒸发，剩下的只有水。因为氢气比空气轻。这与石油钻采、运输、提炼后留给地球上的东西是截然不同的。

燃料电池已经存在了160多年。19世纪30年代，一位名叫威廉·罗伯特·格罗夫爵士的韦尔奇法官改变了已被理解透彻的电解和发电的化学原则。当时，社会对

燃料电池并没有兴趣，对技术潜力也掌握得很少。那个时候，德国发明了内燃机，全球发现了广阔的，似乎是无限的石油储备。这是化石燃料时代的开始，通过使用廉价能源和机器去做事，社会的更多成员都在享受更高的生活水平。尚未认识到燃烧化石燃料的有害影响和较低的资源消耗率，那个时代兴奋了。格罗夫的发明不过是如内燃机一样的新奇事物，但石油使这个年代着迷了。

从格罗夫的时代一直到今天，化石燃料和内燃机都占据着最高统治地位，可能将来还会居于统治地位。眼前迫在眉睫的是有一天社会将耗尽这些化石燃料。大学教师、学者和专家正在讨论我们的自然资源消耗殆尽的确切时间。在每一次对消耗率和时间期限的讨论中一直未变的事实是：化石燃料是一种有限的资源，也就是说，一旦被用完，它们就耗尽了，永远消失了。大部分关于何时我们将最终耗尽化石燃料的预测，都是使用目前的消耗率来预测那一天何时会真正到来。目前的消耗率并不重要，它不是一个静态的数字。这些消耗率在不断增大，因为发展中的世界渴望更高的生活水平，而更高生活水平的一个组成部分就是能量使用的不断增大。无论人们还能坚持5年还是50年，常识表明，人类最终都将不可避免的耗尽化石燃料。这个结果会威胁到能源价格和能源安全。那么，接下来的问题是，社会可以做些什么来避免当需求超过供给时，不断上涨的燃油价格所带来的混乱？答案是氢，燃料电池是顺利过渡到以氢为基础的经济的第一步。

燃料电池和氢正在引导一些强有力的历史潮流。在整个历史过程中，人类的能源使用已倾向于在燃料的化学成分中氢占据更高比例，而其他成分减少。从木材开始，然后到煤、石油和天然气，社会在燃料种类上的转变仅仅是沿着碳氢化物链移动。随着燃料形式的改变，更多的碳被去除了。（化石燃料产生的大部分污染都是来源于碳）氢和燃料电池去除了污染的碳，使用了纯净清洁的氢。抛开历史不谈，燃料电池和氢引领了由增加的环保意识、化石燃料储备的必然消失、健全的经济政策和乐观的股票市场所创造的势头。

核心词汇

electrochemical [i,lektrəu'kemikəl] *adj.* 电气化学的
hydrogen ['haidrəudʒən] *n.* 氢
by-product ['baiprɔdʌkt] *n.* 副产品
carbon ['kɑ:bən] *n.* 碳
nitrous ['naitrəs] *adj.* 氮的，含氮的
stack [stæk] *n.* 堆，大量，一大堆
combustion [kəm'bʌstʃən] *n.* 燃烧
thermodynamics ['θə:məudai'næmiks] *n.* 热力学
conversion [kən'və:ʃən] *n.* 转化，转变
drilling ['driliŋ] *n.* 采钻，钻孔
intrigue [in'tri:g] *vt.* 密谋，激起……的兴趣
detrimental [,detri'mentl] *adj.* 有害的
enthrall [in'θrɔ:l] *vt.* 迷惑
supreme [sju:'pri:m] *adj.* 最高的
pundit ['pʌndit] *n.* 学者，某一学科的权威，博学的人
finite ['fainait] *adj.* 有限的
static ['stætik] *adj.* 不变化的，静态的
turmoil ['tə:mɔil] *n.* 混乱
outstrip [aut'strip] *vt.* 胜过，超过
optimism ['ɔptimizəm] *n.* 乐观，乐观主义

Robots Make Radios

3. 收音机的自动化生产

机经选粹

这一篇是关于制造收音机的自动机械装置的流程。一个英国人为了节省钱而发明了一种ECME的自动化工序，但是工人们认为这样会抢了他们的饭碗，英国因此失去了发展的好机会。

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Robots Make Radios

John Adolphe Szabadi was born in London of Hungarian parents in 1906, changing his name to Sargrove in 1938. He was employed by British Tungsram Electric Lamps Ltd (soon to become British Tungsram Radio Works Ltd) in 1930 and soon became chief engineer in their technical department.

In 1936-7, he made an experimental radio to try out his idea of an integrated 'sprayed circuit' chassis. Did this idea anticipate the printed circuit board? Not really. With the printed circuit board (the invention of Paul Eisler in 1943) the circuits are formed by an etching process on which the separate components are later attached. In the Sargrove method the circuits, resistors, inductances and other components were formed by spraying on to a pre-moulded bakelite panel.

Much of Sargrove's work at British Tungsram was concerned with developing new types of electronic valves (or tubes). One in particular was a "universal" valve, type UA55. It had a slightly reduced performance compared with valves designed for specific uses, but had a wide range of applications.A pamphlet in the Museum's collections describes the construction and use of the valve, dating from about 1948.

The British Tungsram brochure described how the UA55 valve was used with the simple radio receiver designed by John Sargrove for manufacture by Electronic Circuit Making Equipment (ECME) in 1947-8.

The innovative Electronic Circuit Making Equipment (ECME) process and the radio design were fully protected by patents. Using the ECME process it was possible to form on a pre-moulded bakelite panel most of the passive electronic components required in a radio receiver, such as capacitors, inductances, resistors and potentiometer tracks. Sargrove was in this way working towards the concept of the microchip, though in the chip the "component" layers are in a solid "block" with no mounting material.

John Sargrove announced the details of the ECME automatic production system to a meeting of the British Institution of Radio Engineers on 20 February 1947. The meeting was reported in *The Times* the following day and caused great interest throughout the industry.

Sargrove's 1947 paper described the electronic structure of the sprayed-circuit panels in great detail. The last section described the manufacturing process by the ECME machines.

By 1947 the dream had become reality. Sargrove Electronics Ltd designed and built the ECME machines—standing for Electronic Circuit Making Equipment. ECME could automatically produce complete radio circuit panels, ready for final assembly, at the rate of three every minute.

The idea was to reduce manual labour in manufacturing radio sets to a minimum and eliminate errors in wiring. This was done by making the the wiring and components an integral part of a pre-moulded panel. Completed panels only required a few components such as valves to be inserted by hand before the completed assembly was fitted into the set's cabinet. All the ECME operator had to do was feed in the pre-moulded bakelite panels. As the panels passed through, they were grit-blasted, sprayed with metal and graphite, milled, lacquered and tested, emerging twenty seconds later ready for final assembly on the bench.

After spraying with metal the panels passed into the face-milling unit. High-speed diamond tools removed metal from the upper surfaces, leaving it in the grooves and depressions. A second spraying followed, this time with a resistive material such as graphite. The various eyelets, valve bases, potentiometer arms and other components needed were then pressed in automatically. The panel was sprayed with lacquer, and finally the circuits were tested.

After emerging from ECME the circuit boards were fitted with valves and loudspeaker by hand. Then the completed assembly was fitted into the moulded cabinet.

No part of ECME itself has survived, but in the 1960s John Sargrove gave the Science Museum several experimental

radios he had made to test the system, together with specimens of the 'sprayed circuit' panels produced on ECME. These objects, at present in store, remain as a reminder of a brave and pioneering venture in automated production.

Sargrove began his experiments into sprayed-circuit radio manufacture in about 1936. This is an experimental receiver he made either that year or in 1937.



约翰·阿道夫·绍鲍迪1906年出生于伦敦，其父母是匈牙利人。1938年他更名为约翰·萨格罗夫。1930年被英国通斯拉姆电灯有限公司(后更名为英国通斯拉姆无线电产品有限公司)聘用不久，萨格罗夫便升为技术部门总工程师。

1936至1937年间，他制作了一部实验收音机以尝试实现集成“喷制电路”底盘的构想。这是否预见了后来的印刷电路板的出现呢？事实上并不是这样。印刷电路板(1943年由保罗·爱斯勒发明)的制作过程中，电路是蚀刻而成的，然后再将其他各组成部分黏合在上面。而在萨格罗夫的方法里，电路、电阻、感应器等都是被喷射到一个预铸的树胶板上而形成电路板。

在通斯拉姆公司，萨格罗夫的主要工作是开发新型电子管，尤其是开发U A55型“通用”管。与有特殊用途的电子管相比，U A55性能略差些但有更广泛的应用范围。在博物馆的收藏册中记述了这种始于1948年左右的电子管的构造及功能。

1947到1948年，英国通斯拉姆公司的产品说明书上介绍了电子电路制造设备(ECME)如何将U A55型电子管应用于约翰·萨格罗夫设计的简易收音机并进行生产制造。

创新的电子电路设备制造(ECME)工序和无线设计完全受专利保护。运用ECME工序可以在预铸树胶板上形成收音机所需的多数无源电子元件，如电容器、电感器、电阻器、分压器轨等。通过这种方式，萨格罗夫开始朝微芯片理念发展，尽管微芯片中各“元件”层是分布在一个没有敷贴材料的固体“模块”里而不是树胶板上。

1947年2月20日，在英国无线电工程师学会的一次会议上，约翰·萨格罗夫公布了ECME自动生产系统的细节。翌日，《泰晤士报》报道了此次会议并在业内引起广泛关注。

萨格罗夫1947年的论文对喷制电路板的电子结构有详细描述。论文的最后一部分记述了利用ECME器械进行生产的过程。

1947年梦想变成现实。萨格罗夫电子有限公司设计并生产了ECME器械即电子电路制造设备。ECME能以每分钟三块的速度自动生产用于总装的完整收音机电路板。

这个新的生产方法是为了把生产收音机的手工劳动降到最低，同时还要杜绝接线差错。使配线和其他元件成为预铸电路板的一部分，从而达到预期目的。接下来只需将电子管等其他元件手工插入已完成的电路板中便可装壳了。ECME操作员要做的只是将预铸树胶板插入机器。树胶板进入机器后经过喷砂、喷射金属和石墨、碾磨、喷漆和检验，20秒后成型待装。

金属喷射后的电路板进入端铣(面削)加工单元。高速金刚石刀具除去上表面的金属后将它置于凹槽中。接下来是第二轮喷射，此次用石墨之类的电阻材料。然后机械压制各种眼孔、管基、分压器臂及其他所需部分。最后给电路板喷漆并检验电路。

随后，将电子管和扩音器手工装入ECME加工成型后的电路板中，再把该电路板装入机壳。

虽然ECME本身没有任何部分遗留下来，但在20世纪60年代约翰·萨格罗夫将一些用于系统检测的试验收音机和ECME生产的"喷制电路"板样本一起送给了科学博物馆。这些东西目前依然存留着，以纪念自动化生产发展中一次勇敢而具有开拓性的尝试。

核心词汇

department [di'pɑ:tmənt] *n.* 部门，系
circuit ['sə:kit] *n.* 电路
etch [etʃ] *vt.* 蚀刻，铭刻
resistor [ri'zistə] *n.* 电阻器
inductance [in'dʌktəns] *n.* 感应器，感应系数
bakelite ['beikəlait] *n.* 电木，人造树胶
panel ['pænl] *n.* 面板，仪表盘
slightly ['slaitli] *adv.* 轻微地
valve [vælv] *n.* 电子管
brochure [brəu'ʃjuə] *n.* 小册子
capacitor [kə'pæsitə] *n.* 电容器
potentiometer [pəˌtenʃi'ɔmitə] *n.* 电位计，分压计
microchip ['maikrəutʃip] *n.* 微芯片
mounting ['mauntiŋ] *adj.* 敷贴的，支撑的
manufacturing [ˌmænju'fæktʃəriŋ] *adj.* 制造业的，制造的
assembly [ə'sembli] *n.* 装配，集装
cabinet ['kæbinit] *n.* 电路板
lacquer ['lækə] *vt.* 涂漆
eyelet ['ailit] *n.* 小孔，孔眼
loudspeaker ['laud'spi:kə] *n.* 扬声器，喇叭

Making Sense of Shoemaker-Levy 9's Impact with Jupiter

4. 了解苏梅克列维9号彗星与木星碰撞的意义

机经选粹

这一篇讲的是苏梅克—列维九号彗星(Shoemaker-Levy 9, SL9, D/1993F2)，脱离位于太阳系外侧的小行星带进入了太阳系成为周期性彗星。它是一颗于1994年与木星撞击的彗星，也是人们能首次直接观测太阳系的天体撞击事件。它引起了全球不少主流媒体的关注，也吸引了全世界的天文学家去观测它。通过这次事件，人们能知道更多关于木星及其大气的资料。苏梅克—列维九号彗星与木星的相撞具有重要的意义。



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Making Sense of Shoemaker-Levy 9's Impact with Jupiter

When the 19 fragments of Comet Shoemaker-Levy 9 met their violent end on Jupiter last July, it was the celestial drama of the century. Since then, astronomers have been wading their way through vast amounts of data in a bid to reconstruct the details of the collision. At last, a real picture is beginning to emerge.

Fortunately, they knew about the event well in advance and had prepared an arsenal of telescopes and instruments to witness it (*Live crash from Jupiter, New Scientist,*

5 March 1994). But the predictions were cautious. Because the fragments would strike the far side of Jupiter, many astronomers were worried that the impacts would be invisible from the Earth. Also, no one knew whether the collisions would have any lingering effect on Jupiter's cloudy surface.

They need not have worried. The collisions occurred exactly when predicted, but there was more to see than they could ever have hoped. The damage was not subtle—even amateur astronomers using the simplest telescopes were able to watch the aftermath of the explosions. Making sense of this remarkable astronomical event has not been easy, mainly because there is so much evidence to sift through. During Comet Crash Week, scientists took more than a million pictures of Jupiter and recorded a similar number of spectra with wavelengths collectively spanning the whole electromagnetic spectrum. Now, just over five months later, most observers have analysed at least some of their data and the Galileo spacecraft, which had the only direct view of the impacts, has transmitted back to Earth most of its precious tape-recorded data. Galileo's transmission rate has been painfully slow because of the failure of the spacecraft's main antenna to open properly in April 1991.

The first surprise for the astronomers was how much they managed to see, even though the comet collided on Jupiter's dark side. It turned out that the impact site could not have been better for Earth-based observers. For one thing, fragments A, E, G and W created plumes shaped like ice-cream cones which were projected against the black sky above Jupiter's horizon, and were captured superbly on camera by the Hubble Space Telescope. These side views of the plume profiles provided a much better insight into plume eruption physics than looking directly down on them would have done, when they might have been lost in the glare of Jupiter's sunlit clouds. The Hubble science team, led by Heidi Hammel of Massachusetts Institute of Technology, found that all four plumes soared to about 3000 kilometres above Jupiter's ammonia cloud deck.

Happy Coincidence

The angle of view (see Diagrams) also meant that Earth-based observers, and Galileo's instruments, were able to measure the brightness changes associated with the initial hot luminous parts of the collision. Jupiter is so far out in the Solar System that we see its face almost fully sunlit, but little of its shadow (it is never seen as a crescent, or even a quarter). It would have been very difficult to measure the brightness of the luminous phases against a sunlit backdrop. Yet, by good fortune, Jupiter was near "quadrature"—with the Earth off to the side as much as it ever is—so that scientists could see a sliver of Jupiter's night side as well as part of the cylindrical shadow cast behind the planet by the Sun's rays.

Even more fortunately, the fragments hit just behind the "morning" edge, which was in shadow, rather than the "evening" edge, which was bright. So, for example, Hubble managed to pick up light from the glowing plumes that soared up following impacts E and G because they were brightly lit against Jupiter's shadow (see Diagram).

Jupiter spins rapidly—a Jovian day is less than ten hours long—so it took just 10 minutes for the impact sites to rotate into view and less than 10 more minutes for them to rotate into sunlight. High-altitude plumes caught the sunlight even sooner. And as plume debris rained back down into Jupiter's stratosphere, the planet's rotation towards the Earth kept pace, so both Hubble and ground-based observers were able to follow the plume decay.

Also, the Sun rose as the last plume debris re-entered Jupiter's stratosphere creating huge, black "bruises". For the next four hours astronomers photographed the evolution of each impact site, including waves that spread from the point of impact at 450 metres per second, before fading away about three hours later. The speed at which these waves travelled should help to reveal how they were formed, and may even provide clues about the depth to which the fragments penetrated.

If S-L 9 had instead hit just beyond Jupiter's evening edge, everything would have been hidden, even from Galileo's perspective. No shadowed region would have been visible from Earth. The highest plumes might have just appeared above Jupiter's edge before rotation quickly carried them below the horizon. We would have missed plume decay as well as the first few hours of debris spot evolution. By the time the sites had rotated into view five hours later, the propagating waves would have faded, the initial chemical evolution of Jupiter's perturbed atmosphere would be over, and remnant warmth from the millions of megatons of released energy would have dissipated.

The events surrounding one of the brightest and best observed fragments—fragment G—illustrate some of the important things that we have learned to date, and some of the questions that remain unanswered.

Observers at two telescopes at Siding Spring in Australia saw the first signs of the G impact at 7:33:00 on 18 July.

It appeared—in super-sensitive imaging at a wavelength of 2 micrometres—as a faint glow on Jupiter's morning edge. But if the reported times are accurate, the Australian observers must have seen something before the main G fragment hit, perhaps a small, precursor impact. The chief fragment itself was detected 30 seconds later by three instruments on the Galileo spacecraft. The impact flash changed in a few

seconds through spectral hues from ultra-violet into the infrared. As something cools from a searing 10 000 K, its colour changes from blue-white, to yellow, to red-hot, to infrared invisibility, and that must have been what Galileo saw.

Meteoric Flash

Galileo scanned Jupiter every 5 seconds during the G impact. At 7:33:32, the ultraviolet spectrometer detected a flash about 20 per cent of the brightness of Jupiter, which lasted only a few seconds and was gone. The photopolarimeter radiometer (PPR) also recorded the modest beginnings of an event at 7:33:32 which then brightened and lasted for more than half a minute. Comparison of the UVS and PPR data at 7:33:32 shows that the detected radiation came from a source just 7 kilometres across at a temperature of 8000 K. This was almost certainly the impact's "bolide" phase, where the fragment flashed like a brilliant meteor as it streamed down through Jupiter's atmosphere. PPR data on the H and L impacts, as well as Galileo camera images of K, N and W, also show they suddenly became brighter, going from nothing to maximum luminosity in just 2 or 3 seconds, and this is exactly the time it would take the fragments, which were travelling at 60 kilometres per second, to plunge down onto Jupiter's cloud tops.

The near infrared mapping spectrometer (NIMS) on Galileo cannot detect extremely hot phenomena, but is tuned to detect heat at temperatures of hundreds to a few thousand Kelvin by measuring at several longer wavelengths in the so-called thermal infrared. NIMS saw nothing at 7:33:32, but 5 seconds later it detected a rising signal that grew and decayed over about a minute and a half. NIMS spectra show that by 7:33:37 (5 seconds after impact), the luminous source had already cooled to about 6000 K (the surface temperature of the Sun). It was still low in the atmosphere, just above the ammonia clouds. But over the next minute and a half, NIMS measured the source expanding to 75 kilometres in size as it rose toward the top of Jupiter's atmosphere and cooled to just 450 K.

NIMS team leader Robert Carlson of the Jet Propulsion Laboratory in California comments: "Very simply, it looks to us like an expanding, cooling 'bubble' of hot gas." In other words, this was the "fireball" phase, in which a huge volume of Jupiter's atmosphere expanded and was expelled to form the beginnings of a plume.

A few months before the crash, Kevin Zahnle of NASA Ames Research Center in Moffett Field, California and Mordecai Mac Low of the University of Chicago predicted that there would be a 10 or 20-second delay between the fiery fragments disappearing



beneath the clouds (the bolide phase) and the fireballs erupting back into view. But Mark Boslough and David Crawford, from Sandia National Laboratories, Albuquerque, used numerical simulations on the world's fastest computer, Sandia's 1840-processor Paragon, to predict that the upper part of the fiery bolide train would explode immediately, and would itself form the top of the fireball. Boslough and Crawford were proved right—there was no gap between the bolide phase and the subsequent fireball for impact G and the other well-observed impacts. So it seems that most of the observable activity was high in the atmosphere; whatever happened lower down was much harder to see.

At 7:33:46, Hubble's camera shutter closed after a 30-second exposure through its methane filter. The picture shows a bright glow above the shadowed edge of Jupiter, well below the level where it could be sunlit. At first, it seemed to be the radiant fireball, but scientists quickly realised that this could not be the case. If Galileo's recorded impact time of 7:33:32 is correct, the fireball would have to have rocketed upwards at an unbelievable velocity of 40 kilometres per second to reach Hubble's line of sight so soon. Hubble's open shutter must somehow have caught the bolide entry and/or fireball by reflected light, perhaps from high-altitude debris lofted by an earlier precursor event. Such hints of precursor events could mean that the G fragment was actually a collection of smaller comet fragments.

The South Pole Infrared Explorer (SPIREX) caught its first glimpse of G half a minute after impact. Although the actual explosion was already over, the show from the Earth was just beginning. Less than a minute later, looking through fog and 98 per cent humidity, it was the turn of NASA's Infrared Telescope Facility atop 13 000 foot Mauna Kea in Hawaii. Between 7:35:16 and 7:35:32, Hubble took a picture that shows the tip of the plume reaching sunlight, nearly 2000 kilometres above Jupiter's cloud deck, implying a vertical velocity of 15 kilometres per second. By 7:35:47, the Australian observers measured an infrared signal sixty times stronger than their first detection 3 minutes earlier.

Sunlit Plume

Over the next 8 minutes, the G plume brightened a hundred times more as seen from Australia, due to the expansion detected by Hubble and the fiery debris beginning to cascade back down onto Jupiter. At its peak, the plume towered 3200 kilometres above Jupiter's clouds.

Observing from the South Pole, Hien Nguyen exclaimed: "My God, it was bright!" Soon afterwards, Peter McGregor at the Australian National University's telescope at Siding Spring took the most memorable picture of Comet Crash Week. It looks like a

brilliant, star-like "explosion" on the edge of a faintly visible Jupiter, but is in fact the sunlit plume at its maximum extent and the glowing zone caused by the plume falling back onto Jupiter.

From Earth, fragment G's thermal radiation reached its maximum value about 19 minutes after impact, according to a team of observers flying out of Melbourne, Australia, on NASA's Kuiper Airborne Observatory. By then, the impact site had rotated into full view from the Earth and the debris was raining back down at more than 10 kilometres per second, elevating temperatures across a vast region of Jupiter's stratosphere. Over the next few hours, the impact apron gradually cooled.

Meanwhile, J. Watanabe and other astronomers at the Okayama Astrophysical Observatory in Japan reported that a new dark spot, larger than Jupiter's famous Great Red Spot and twice the size of the Earth, was rotating across the planet. The next time the G site rotated around, French observers detected—for the first time ever on Jupiter—the spectroscopic emission signature of hot carbon monoxide.

This could explain one of the biggest post-crash puzzles—what happened to the water? Comets contain large amounts of water ice. Also, before the crash everyone expected the fragments to penetrate beneath the hydrosulphide clouds on Jupiter to water-rich regions, from where the fireball would carry the water up into the visible stratosphere. So the question was not whether water would be observed, but what fraction would come from the comet and what fraction from Jupiter. Initial reports that no one had detected any water led to speculation, mainly in the news media, that Shoemaker-Levy 9 was really an asteroid, not a comet—a pointless exercise in nomenclature, since the interiors of many asteroids are thought to be as icy as comets.

Spectral Signature

Later, in a circular published by the International Astronomical Union, Gordon Bjoraker from NASA's Goddard Spaceflight Center in Maryland reported that the Kuiper Airborne Observatory had caught a brief glimpse of the spectral signature of hot water in impacts G and K before the temperatures cooled and the signatures (but not necessarily the water itself) disappeared. Water is highly reactive and may have been rapidly consumed. One possibility is that the oxygen from the water was converted into carbon monoxide, as detected for fragments G and K. The jury is still out on whether the water came from the comet or from Jupiter.

Another puzzle is that at first sight all the impacts seemed remarkably similar, in spite of the varying sizes of the different fragments. One of the most contentious

issues before the comet crash concerned the sizes of the comet fragments. If they were 3 or 4 kilometres across, the original comet would have been the size of the huge projectile that struck the Earth 65 million years ago, possibly causing the extinction of the dinosaurs, and the like of which has fortunately not been seen since. But if they were only a few hundred metres across the situation is much more worrying. In that case, havoc such as that wrought on Jupiter could be caused by the smaller comets that strike the Earth much more often—every million years or so. The tiny N fragment's bolide brightness was more than half that of superfragment K. And the four plumes photographed by Hubble reached the same altitude, including giant G and wimpy W.

Invisible Energy

We may never be able to calculate fragment masses from the bolide and plume phenomena. After all, the total luminous energy measured by Galileo was less than 0.1 per cent of the total energy that a 1-kilometre solid fragment should have released upon impact with Jupiter. Since nobody imagines that all this havoc was wrought by fragments less than 100 metres in size, most of the energy must have been released invisibly. Perhaps all of the fragments had a similar effect on Jupiter's upper atmosphere as they streaked through, while vast differences were muffled deep within the planet's gaseous interior, and thus hidden from our view. It is as if we tried to determine, just from measuring how much water squirts from a hose, whether its source is a cistern or the whole city water supply.

Attempts to understand the effects of the comet on the chemistry of Jupiter's atmosphere have yet to produce clear results. Usually astronomers struggle to detect weak spectral signatures, but this time they were overwhelmed with information. The signatures varied with time as the impact sites evolved, and they also differed greatly from one impact to the next. Some stratospheric contaminants were clearly derived from the comet (see The astronomical detective's toolkit), while others were so abundant that they must have been dredged up from Jupiter's atmospheric depths. For example, it is inconceivable that the single G fragment could have brought in the 100 million tons of molecular sulphur (S2)—not to mention the sulphur contained in detected CS2 and H2S—that was measured several hours after the impact of fragment G by Hubble's Faint Object Spectrograph. Before S-L 9 no one had seen sulphur in any form in Jupiter's atmosphere, although a layer of ammonium hydrosulphide clouds had long been thought to exist beneath the visible ammonia clouds. It took S-L 9 to stir the pot.

There is so much information about the collisions that we should eventually learn the answers to these questions. Meanwhile, it is worth noting that for each impact,

the release of explosive energy into Jupiter's atmosphere was all over within the first few seconds. Even the fireballs had cooled below Galileo's NIMS detection limit while they were still hidden from Earth behind Jupiter's horizon. What stunned observers on Earth over the ensuing 20 minutes was the aftermath—towering plumes of gas and the firestorm of debris dramatically plunging back into Jupiter's atmosphere, carried into direct view by the planet's rotation. The resulting black spots, some over 20,000 kilometres across, provided every Jupiter-watcher on Earth with a chilling warning of what a small comet or asteroid could do to the atmosphere of our own planet.

The Astronomical Detective's Toolkit

The terrific heat generated by the Shoemaker-Levy 9 impacts enabled astronomers to use powerful new observational tools to "see" the events. At optical wavelengths even the brightest impacts and plumes were over-whelmed by the glare from Jupiter's reflected sunlight, and were virtually invisible to Earth-based observatories. But at thermal infrared wavelengths (from 3 to 50 micrometres), Jupiter is normally faint because it receives hardly any warmth from the distant Sun and its internally generated heat is minimal. So "room-temperature" events, not to mention fireball phenomena at thousands of degrees, would be prominent by comparison. Sensitive infrared cameras have been developed only during the past decade.

Many of the beautiful photographs published during Comet Crash Week show the "light" of thermal radiation from the impacts' residual warmth and the firestorm of debris re-entering the atmosphere.

The most spectacular pictures used another technique in the infrared astronomer's toolkit—methane absorption band filters. Such filters admit only a small range of wavelengths, near 2 micrometres, centred on absorption bands in the spectrum of methane. Though methane is only a trace constituent (0.2 per cent) of Jupiter's atmosphere, it absorbs sunlight so effectively that Jupiter is virtually black at methane-band wavelengths, even at long exposures. Thus, any high-altitude, sunlight material above the methane (like ejecta arching through space), look brilliant against the muted backdrop of Jupiter. If such features are also hotter than several hundred degrees K, their 2 micrometre thermal radiation further enhances their brightness. Heat from ejecta plummeting back into the top of Jupiter's stratosphere 15 to 20 minutes after the impacts explains some of the longer-lasting features on the 2-micrometre filter pictures.

For days and weeks after the impacts, infrared images of Jupiter continued to show bright regions at the same places that visible images showed enormous, black "bruises"

on Jupiter. They were black because they contained vast numbers of aerosol particles created in the explosions, perhaps from organic material in the cometary fragments, or from high-temperature processing of large volumes of Jupiter's atmosphere. Depending on wavelength, the infrared images recorded local stratospheric warmth left over from the impacts or sunlight reflected by the new, very-high-altitude aerosol layers, undimmed by methane absorption.

Many tell-tale spectroscopic lines, used for chemical analysis, are activated only at hot temperatures. A number of chemical compounds never seen before in Jupiter' s stratosphere suddenly, though briefly, radiated their spectroscopic signatures, thanks to the temporary heat in the aftermath of the explosions. Some of the new or enhanced spectral lines were due to normal constituents of Jupiter's atmosphere at abnormally high temperatures.

Radiation emitted from excited methane molecules during the first 15 minutes after several impacts showed temperatures near 1000 K. Other chemical species (such as sulphur compounds) were dredged up by the fireballs from beneath Jupiter's ammonia cloud decks, where they normally reside. Disintegrated cometary material also contributed to the wealth of spectral emission lines. Keith Noll at the Space Telescope Science Institute in Maryland and his Hubble team detected ionised metals including magnesium and iron, which are usually found in rocks, not atmospheres. Jupiter' s own stratospheric chemistry also joined in, as chemical reactions fostered by high temperatures redressed the imbalances caused by the impacts. This rich chemical feast, revealed by a panoply of spectral lines from ultraviolet to radio wavelengths, will take years to decipher completely.

参考译文

去年7月，苏梅克列维九号彗星的19块碎片遭遇了木星毁灭性的撞击之后，太空中上演了一出世纪性的戏剧盛宴。从那之后，天文学家一直试图通过大量的数据来重现撞击的详细情况。最后，一幅真实的图景开始浮现出来。

幸运的是，他们提前知晓整个事件并且准备了大批天文望远镜和仪器进行观测(1995年3月5日发表在《新科学》上的《来自木星实况性撞击》记载)。但是，科学家们对于这次事件的预测却是谨小慎微的。因为碎片会撞击木星远离地球的一端，许多天文学家担心在地球上可能会看不到撞击。同样地，也没有人知道此次冲撞是否会对木星多云状表层造成长久的影响。

碎片G撞击木星时，伽利略号飞船每5秒就对其进行观测。在7:33:32，紫外分光计(U V S)探测到一束为木星亮度20%的光，仅持续数秒之后就消失了。光偏振辐射计(PPR)

同样记录了7:33:32的一场大撞击开始时的一些适度的小碰撞，发出亮光并持续了半分多钟。紫外分光计(UVS)和光偏振辐射计(PPR)在7:33:32的数据的对比显示被探测到的放射物是穿越了8000K高温的，放射源就在7公里远处。基本确定这就是撞击时的火流星状态，碎片像流星般闪烁滑落在木星的大气层。光偏振辐射计(PPR)关于H和L碎片的撞击数据以及伽利略号关于碎片K，N和W的图片也显示碎片突然之间变亮。从什么都看不见到亮光到达最强仅仅用了2−3秒的时间。这也正是碎片以每秒60公里的速度移动并闯入木星云雾上端的时间。

伽利略号上的红外绘图分光仪(NIMS)不能探测极热现象，只能通过所谓的热红外仪测量数个波长来探测在几百到几千K之间的热量。红外绘图分光仪在7:33:32什么也没观测到，但是5秒钟之后，探测到一个增强的信号的消长，大约有一分半钟左右。红外绘图分光镜显示到7:33:37时(撞击后的5秒钟)，光源温度已经降低到6,000K(太阳表面的温度)。其在太空中的位置仍然很低，仅仅处于氨水云层之上。但是在一分半钟之后，红外绘图分光仪探测到光源范围扩大到75公里远，当其向木星大气层上部上升时，温度降到只有450K。

与此同时，渡边淳弥和日本岗山天文观测站的其他天文学家们报告了一个新的黑斑正围绕着木星转动，比其著名的大红斑还要大，大约是地球的两倍大。当下一次在G碎片绕其旋转时，法国观测员发现分光仪显示有热一氧化碳存在，这也是在木星上第一次发现它的存在。

这也许可以解释撞击后的一大难题——水状物怎么了？彗星含有大量的水冰。同样，在撞击之前，每个人都期望碎片穿透木星的氢硫化物云层的下面到达“丰水”区，从那里火球把水状物带到可以观察到的平流层。所以，问题不在于是否可以观察到水状物，而是分析出水状物有多少来自于木星，又有多少来自于彗星。先前的报告主要是来自新闻媒体，在报告中没有检测到水状物，这使得人们推测到：既然小行星的内部被认为是像彗星一样的多冰。那么苏梅克列维九号彗星是位于火星与木星之间的一颗小行星，并不是一颗彗星，给它彗星这个名称是无意义的。

也许我们永远不可能从火流星和幔羽现象中计算出碎片的质量。毕竟，伽利略测量出的发光能量没有达到绵延一公里远的固体碎片撞击木星所释放的总能量的0.1%。因为没有人能够想像这场大撞击竟然是由范围不足100米的碎片造成的，大部分能量都已经被释放出来了然而我们却看不到。也许所有的碎片疾驰闯过木星上层大气对其造成的影响极为相似，然而，对该星体气体似的内部结构造成的影响却不尽相同，因此，我们是看不到的。这就像我们试着测定软管喷出来的水量来判断其究竟是从水箱里还是从城市的供水处流出来的一样。

人们试图了解彗星给木星大气层化学组成造成的影响，现在已经有了清晰的答案。通常情况下，天文学家努力探测微弱的光谱特征，但是这一次他们得到了大量的信息。随着撞击点的扩大，因时间不同，撞击特征也不尽相同，并且前一次撞击和下一次的也不同。一些同温层的污染物来自于彗星。然而，必须从木星的深层清除其他的很多污染物。例如，G碎片就可能带来10亿吨二氧化硫分子，更别说所包含的探测到的二硫化碳、硫化氢。这是G碎片撞击木星几个小时后哈勃光谱摄制仪探测到的。舒梅克列维九号彗星撞击木星之前，没有发现木星大气中以任何形式存在的硫元素。尽管有一层氨氢硫存在于清晰可见的氨云层下面。然而，苏梅克列维九号将其搅开了。

有很多关于撞击的信息，从中我们最终应该寻找到这些问题的答案。同时，却又是不

值得我们这么做的。因为每一次撞击释放入木星大气层的爆炸性能量在头几秒钟就已经结束了，甚至连火球也已经冷却，这在地球上也是看不到的。令观察人员吃惊的是持续20分钟观测到的余波塔形幔羽状气体和碎片的风暴性大火极其快速地闯入木星大气层，在星球转动的过程中可以直接看到。撞击制造的黑斑，有些绵延超过了20,000公里，使每一位观测者不寒而栗。可以想象一颗小的彗星或小行星对于我们自己星球的大气层是多么的危险。

在第一个15分钟内几次撞击后，活跃的甲烷分子的辐射物的温度将达到1,000K左右。其他化学物质像硫化物，被木星氨云层下的火球清除，通常这些化学物质包含在氨云层下。彗星瓦解后的物质也对光谱射线很有帮助。马里兰州空间天文学研究所的基斯·洛尔(Keith Noll)和他的哈勃研究团队探测到了通常存在于岩石中的而非大气中的离子金属，有镁和铁。也有属于木星平流层自身的化学物质，因为由高温引起的化学反应改变了由撞击引起的不平衡。这些波长在紫外到无线电波之间的光谱射线显示的丰富化学成分之谜需要数年才能完全揭开。

核心词汇

fragment ['frægmənt] *n.* 碎片
collision [kə'liʒən] *n.* 碰撞，冲突
arsenal ['ɑ:sinl] *n.* 供应，库存
scan [skæn] *vt.* 观测，扫描
spectrometer [spek'trɔmitə] *n.* 分光计
radiometer [ˌreidi'ɔmitə] *n.* 辐射计，放射计
luminosity [ˌlju:mi'nɔsiti] *n.* 光度，亮度
decay [di'kei] *vi.* 衰退
spectroscopic [ˌspektrə'skɔpik] *adj.* 分光镜的，藉分光镜的
monoxide [mə'nɔksaid] *n.* 一氧化物
hydrosulphide [ˌhaidrəu'sʌlfaid] *n.* 氢硫化物
nomenclature [nəu'menklətʃə] *n.* 专门语，术语
interior [in'tiəriə] *n.* 内部
wrought [rɔ:t] *adj.* 制造的，加工的
cistern ['sistən] *n.* 贮水器，水槽，水箱
stratospheric ['strætəu'sferik] *adj.* 同温层的，平流层的
sulphur ['sʌlfə] *n.* 硫
firestorm ['faiəstɔ:m] *n.* 核心爆炸引起的爆炸风暴
dredge [dredʒ] *vt.* 清除，疏通
decipher [di'saifə] *vt.* 译解，揭开

Mars Ski Report: Snow Is Hard, Dense and Disappearing

5. 火星滑雪报告：雪场又硬又实而且还在逐渐融化

机经选粹

这一篇是讲火星上冰层的融化问题。有人猜测是温度变化造成的。一个科学家M对此做了一些研究，描述冰层融化的速度，指出冰层的组成部分是CO_2，而不是融化的水。冰帽中的冰和二氧化碳会在一个世纪内消失。但是最后没有得到足够的证据证明是由温度变化造成火星上冰层的融化的。

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Mars Ski Report: Snow Is Hard, Dense and Disappearing

Mars would make a lousy host for the Winter Olympics. Yes, there's the lack of air to consider. But more important, Martian snow turns out to be rock hard. Worse, it is melting away at an alarming rate.

In fact, Mars may be in the midst of a period of profound climate change, according to a new study that shows dramatic year-to-year losses of snow at the south pole.

It is not yet clear, though, if the evidence of a single year's change represents a

trend. But the study provides a surprising new view of the nature of the southern ice cap, said Michael Caplinger of Malin Space Science Systems.

"It's saying that the permanent cap isn't quite so permanent as we thought," Caplinger said in a telephone interview.

A second study of both poles finds that Red Planet snow is more dense and hard than the euphemistic "packed powder" advertised by Eastern ski resorts, and nothing like the soft flakes expected in Utah for the 2002 Olympics. Instead, it's hard as ice.

Though unrelated, the two studies were based on observations made by NASA's Mars Global Surveyor and both will be published in the Dec. 7 issue of the journal Science.

The combined observations represent an exciting new way to look at Mars' atmosphere and how it interacts over time with the polar caps and even soil at mid-latitudes, said David A. Paige, a researcher at the University of California, Los Angeles.

"The new data are showing what's going on on Mars seasonally as well as on interannual time scales in much more detail than we had with previous observations," Paige told SPACE.com.

Where the Snow Is

Both of Mars' polar regions are covered in permanent caps of ice. Scientists have known since the 1970s that some of the ice in the north is water ice. There may be water ice in the south, too, but there is no firm evidence. Both poles are covered in a veneer of carbon dioxide ice, popularly called "dry ice" here on Earth.

Each cap grows during its winter and recedes in summer.

The research into snow density, lead by David E. Smith of NASA's Goddard Space Flight Center, confirm that much of the Martian snow is in fact composed of carbon dioxide.

The study involved more than 400 million elevation measurements spanning more than one Martian year, from February 1999 through May of 2001.

The orbiting spacecraft bounced a beam of laser light to the surface and back, recording the round-trip time to determine elevations within 4 inches (10 centimeters). To determine snow density, this data was compared with measurements of tiny variations in the gravity field caused when there is more or less snow at given locations.

Smith and his colleagues also measured for the first time how the elevation of Mars' surface changes during the seasons, as ice builds up in winter and returns to the

atmosphere in summer.

As expected, each polar ice cap is highest in the dead of its winter, when it is in total darkness. Also no surprise was the finding that the biggest changes in snow depth—more than 6 feet (2 meters) occurred close to the poles.

But the overall bulk of snow accumulation seems to take place at in thinner but vast sheets at lower latitudes, the study found.

Strange Snows

As with Earth, the weather on Mars can be strange.

Smith's study also found odd off-season snowfalls on Mars. Because carbon dioxide does not like to be a liquid, it freezes directly out of the atmosphere into surface dry ice. It's possible shadowed areas could accumulate this "snow" regardless of the season, said Maria T. Zuber, an MIT geophysicist who also worked on the study.

In one case, patches of snow disappeared during autumn in the northern hemisphere—a time when cooler temperatures should have generated accumulations. A huge dust storm that raged in recent months and for a time covered the entire planet may have been responsible, temporarily raising global temperatures. But Zuber said the deviations are not yet understood.

Global Warming on Mars?

In the other study, led by Michael C. Malin, features at the south pole were observed to retreat by up to 10 feet (3 meters) from one Martian year to the next.

The odd shapes—circular pits, ridges and mounds—were first photographed in 1999. Since then, the features have eroded away by up to 50 percent.

The pits are growing, the ridges between them shrinking.

Caplinger and Malin caution that a year's worth of data does not reveal when this erosion began or how long it will continue. Yet they speculate that the features could have been created in a Mars' decade and may erode away completely within one to two decades.

"We know that the pits we see at the surface today are not very old, and that they will not last very long," Malin said.

Water or Not?

The rate of erosion suggests the features are made of moderately dense but solid

carbon dioxide, rather than water ice, the scientists conclude. But that does not preclude the possibility of water ice at the south pole.

"We don't know what's underneath," Caplinger said. "You could certainly have water ice under carbon dioxide."

He said the only way to find out is to go there and drill down.

The newly observed melting, if it is part of a trend, could pump enough carbon dioxide in the atmosphere of Mars to increase its mass by 1 percent per decade, the scientists said. Already, the atmosphere of Mars is roughly 95 percent carbon dioxide.

Caplinger said no one knows for sure what effect the extra carbon dioxide might have on the climate. "Not much," he figures.

But he said many scientists assume that Mars undergoes climate change. Photos of the surface suggest water may once have flowed on Mars, implying that it would have been warmer. And Earth's ice ages offer the lesson that change is inherent in a climate.

New Era of Study

Despite more than three decades of Red Planet exploration, scientists are still relatively clueless about the climate of Mars, said Paige, the UCLA researcher. Continuous or recurring observations have typically been confined to short time periods.

The two new studies herald a change, Paige said. And expect more.

Mars Global Surveyor is not done studying Mars, and the recently arrived Odyssey orbiter will begin science observations early next year. Other satellites and surface probes are planned every couple of years over the next decade.

"We're moving toward a situation where we'll have a permanent spacecraft presence on Mars," Paige said.


参考译文

火星可能会是冬季奥运会的一个糟糕的东道主。是的，因为它缺少空气。但更重要的是，火星上的雪像岩石般坚硬，愈加糟糕的是，它正以惊人的速度融化。

一项新的研究显示，火星南极的积雪多年来急剧减少。事实上，火星上的气候可能

正发生着巨大的变化。

不过，科学家目前尚不清楚单独一年的变化是否代表着一种趋势。不过，马林空间科学系统公司的迈克尔·开普林格说，该研究为了解火星南极冰盖的属性提供了一个令人惊讶的全新视角。

开普林格在电话采访中说："这就是说，永久性冰盖并非我们想象的那么坚固。"

对两极地区的再次研究发现，火星降雪比东方滑雪场宣传的所谓的"包装粉"密度更大更坚硬，与2002年美国犹他州因为奥运会的到来而期待的柔软的雪花是完全不同的。相反，它坚硬如冰。

尽管这两项研究毫无关联，但它们都是建立在美国国家航空航天局"火星环球勘探者号"的观测的基础上，并且这两项研究都将于12月7日刊登在《科学》杂志上。

洛杉矶加州大学的研究员大卫·A·佩奇说，这两项观察结合起来为研究火星大气层和大气层是如何随着时间流逝与两极冰盖甚至与中纬度的土壤互相作用而影响的开辟了令人兴奋的新途径。

佩奇对空间网说："新的数据显示了火星的季节性变化以及年际变化，这比我们之前的观察结果更加详细。"

火星的两极地区都被永久性的冰盖所覆盖。早在20世纪70年代，科学家们就都知道了北极有一部分冰是水冰。可能南极也有水冰，但还没有确凿的证据。两极都覆盖着一层二氧化碳冰，即地球上惯称的"干冰"。

冰盖每年冬季增厚，而夏季消退。

由美国国家航空航天局戈达德太空飞行中心的大卫·E·史密斯领导的关于积雪密度的研究证实，火星上大部分的积雪其实是由二氧化碳组成的。

该研究涉及4亿多次海拔测量，跨越了从1999年2月到2001年5月一个多火星年的时间。

轨道运行飞行器向火星表面发射一束激光，使之反射回来并接收，记录往返的时间从而确定海拔，精度在4英寸(10厘米)以内。为了确定雪的密度，这个数据会用来与某些指定地点在重力的影响下或多或少雪量的微小变化的测量结果作比较。

史密斯和他的同事们还首次测量了火星表面海拔是如何随着季节的变换而改变的，因为冰在冬天累积，而在夏天重回大气。

正如所料，两极的冰盖在隆冬时是最高的，此时的火星正处于极夜。还有一个不足为奇的发现，那就是积雪深度上的超过6英尺(2米)最大变化发生在靠近极地的地方。

不过研究发现，大部分的积雪似乎都发生在低纬度积雪较薄的广大区域。

与地球相比，火星上的气候要奇怪一些。

史密斯的研究也发现了火星上奇怪的反季节降雪。麻省理工学院同样从事该项研究的地球物理学家玛丽亚·T·祖博指出，由于二氧化碳通常不以液态形式存在，它在大气中直接冻结成表层干冰。阴影区有可能可以不分季节地积累这种"雪"。

有一次，秋天的火星北半球有一小部分的冰雪消失了，事实上此时较低的温度本应该导致积雪的。近几个月发生的一次巨大的沙尘暴可能是该现象产生的原因。沙尘暴曾一度覆盖整个行星，引发了临时性的全球升温。

不过祖博说，这种反常现象的原因至今还无从得知。

科学家们总结，侵蚀的速率表明，这些雪是由中度密集的固体二氧化碳构成的，而不是水冰。但是，这并不排除南极有水冰的可能。

“我们不知道底下是什么，”开普林格说：“但可以肯定二氧化碳下面有水冰。”

他说，唯一的方法就是亲身到那里进行钻取。

科学家说：“最近观察到的融化现象如果是该趋势的其中一部分的话，那么它会向火星大气中注入足量的二氧化碳，使其在大气中的含量每十年增加1%。火星大气中有大约95%都是二氧化碳。”

开普林格说，没有人能够确定这些额外的二氧化碳会对气候造成什么影响。他估计：“影响应该不大。”

但他说，许多科学家认为火星正经历着气候的变化。火星表面的照片表明，火星上曾出现过流动水，这意味着它一直在变暖。地球的冰河年龄也证明，气候变化是固有的现象。

加州大学洛杉矶分校研究员佩奇说，尽管人类对于火星的探索已进行了三十多年，但科学家们仍不了解火星的气候。连续或循环观察通常只限于短期内。

这两项新的研究预示着变化，佩奇说，我们期待更多。

“火星环球勘探者号”还没有完成对火星的研究，而最近抵达轨道的“火星奥德赛”号人造卫星也将于明年年初开始科学观测。其他卫星和表面探测器也计划在接下来的十年里每隔两年就进行分批发射。

佩奇说：“我们正在努力实现一个目标，那就是我们要拥有一个永久驻留在火星上的宇宙飞船。”

核心词汇

lousy ['lauzi] *adj.* 差劲的

rock [rɔk] *n.* 岩石，巨石

midst ['midst] *n.* 中间，当中

profound [prə'faund] *adj.* 极深的，深奥的

interview ['intəvju:] *n.* 访问

euphemistic [ˌju:fə'mistik] *adj.* 委婉的

flake [fleik] *n.* 小片，雪花

exciting [ik'saitiŋ] *adj.* 令人兴奋的

seasonally ['si:zənli] *adv.* 季节性地

interannual [ˌintəæn'tenəl] *adj.* 年度的

popularly ['pɔpjuləli] *adv.* 一般地，通俗地

confirm [kən'fə:m] *vt.* 确定，证实

compose [kəm'pəuz] *vt.* 组成

elevation [ˌeli'veiʃən] *n.* 海拔，提高

darkness ['dɑ:knis] *n.* 黑暗

snowfall ['snəufɔ:l] *n.* 降雪

geophysicist [dʒiə'fizisist] *n.* 地球物理学者

preclude [pri'klu:d] *vt.* 预先排除

pump [pʌmp] *vt.* 打气，注入

imply [im'plai] *vt.* 暗示，意味

clueless ['klu:lis] *adj.* 无能的，笨的

recur [ri'kə:] *vt.* 回到，重现

presence ['prezns] *n.* 出席，在场



Composition of a Comet

6. 彗星的组成

机经选粹

这一篇是关于彗星的形成，文章介绍了太阳系形成的原因，以及彗星与气象的关系，难度中等。

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Composition of a Comet

A comet consists of a sharply defined nucleus, looking like a star to the eye, embedded in a nebulous cloud called the coma. There are many different theories about the composition of comets. One of the best known theories is that of the american astronomer Fred L. Whipple who proposed in 1949 that the nucleus, containing practically all the mass of the comet, is a "dirty snowball" consisting of ices and dust. Evidence for the snowball theory rests on various data. For one thing, the best-observed comets move in orbits that are not identical to the one before. This provides clear evidence that the escaping gases produce a jet action, propelling the nucleus of a comet slightly away from its otherwise predictable path. In addition, short-period comets, observed over revolutions, tend to fade very slowly with time, as would be expected of the kind of structure proposed by Whipple. The head of a comet, including the hazy coma, may exceed the planet Jupiter, or sometimes even the Sun, in size. The solid portion of most comets, however, has a volume of only a few cubic kilometers. The dust-blackened nucleus of Halley's comet, for example, is about 15 by 8km (9 by 5 mi) in size.

History of Comets

Appearances of large comets were regarded as atmospheric phenomena until 1577, when the Danish astronomer Tycho Brahe proved that they were celestial bodies. In the 17th century the English scientist Isaac Newton demonstrated that the movements of comets are subject to the same laws that control the planets in their orbits. By comparing the orbital elements of a number



of earlier comets, Edmund Halley showed the comet of 1682 to be identical with the two that had appeared in 1607 and 1531, and he successfully predicted the return of the comet, which reappeared in 1758. The earlier appearances of Halley's comet have now been identified from records dating from as early as 240 BC. Halley's comet passed round the Sun most recently early in 1986. As it once more headed outward, it was visited in March of that year by two Soviet-constructed probes, Vega 1 and 2, and by another instrumented package called Giotto, launched by the European Space Agency. Two Japanese craft observed it from a great distance as it passed.

Solar Effects of Comets

As a comet approaches the Sun, the solar heat evaporates, or sublimates, the ices so that the comet brightens enormously. It may also develop one or more tails, sometimes extending many millions of kilometers into space. The tail is generally directed away from the Sun, even as the comet recedes again. The gaseous tails of comets are often straight and highly structured, being composed of simple ionized molecules, including carbon monoxide and carbon dioxide. The molecules are blown away from the comet by the action of the solar wind, a thin stream of hot gases continuously ejected from the solar corona, the outermost atmosphere of the Sun, at a speed of 400 km/s (250mi/s). Comets frequently also display curved tails, much smoother in appearance, composed of fine dust blown from the coma by the pressure of solar radiation. As a comet recedes from the Sun, less gas and dust are lost, and the tails disappear. Some of the comets with small orbits have tails so short that they are practically invisible. On the other hand, the tail of at least one comet has exceeded 320 million km (200 million miles) in length. The variation in length of the tail, together with the closeness of approach to the Sun and Earth, accounts for the variation in the visibility of comets. Of some 1,400 comets on record, fewer than half the tails were visible to the naked eye, and fewer than 10 percent were conspicuous.

Periods and Orbits

Comets have elliptical orbits, and the periods of about 200 comets—the time they take to orbit the Sun once—have been calculated. Encke's comet has a period of only 3.3 years; Donati's comet of 1858 has one of 2,000 years; But the majority of comets have even longer periods. The orbits of most comets are so vast that they are virtually indistinguishable from parabolas—open curves that would take the comets out of the solar system-but from careful observations astronomers have found that they too are ellipses, albeit of great eccentricity, and with periods measured in millions or tens of millions of years. At the extremes of their motions, far from the Sun, the orbits of many comets are significantly affected by passing stars, and even by the overall gravitational effect of the galactic disc. No comets have been known to approach the Sun on a strongly hyperbolic orbit; this would have meant an origin beyond the solar system, in interstellar space. Some comets, however, may leave the solar system, never to return, because of small alterations of their original

orbits by the gravitational action of the planets. Such action has been observed on a smaller scale. *About 160 short-period comets have orbits that have been influenced by the planet Jupiter, and are said to belong to the family of Jupiter. Their periods range from 3.3 to 9 years or more.*

Comet Groups

When several comets travel in nearly the same orbit, they are said to be members of a comet group. The most famous group includes the spectacular Sun-grazing comet, Ikeya-Seki, of 1965, and seven others having periods of nearly a thousand years. *The astronomer Brian G. Marsden has concluded that the 1965 comet and the even brighter comet of 1882 split from a parent comet, possibly that of 1106. This comet and others of the group Probably split away from a truly gigantic comet thousands of years ago. A close relationship also exists between the orbits of comets and those of the particles (meteoroids) that produce meteor showers. The Italian astronomer Giovanni Virginio Schiaparelli proved that the Perseid meteors, which appear annually around August 12, are associated with Comet Swift -Tuttle. Similarly, the Leonid meteors, which appear annually in November, are closely associated with Comet Tempel-Tuttle. Several other showers have been related to known cometary orbits, and are explained as the stream of debris scattered by a comet along its orbit.* Comets were once believed to come from interstellar space. Although no detailed theory of origin is generally accepted, many astronomers now believe that comets originated in the outer, colder part of the solar system from residual planetary matter in the early days of the solar system. *The Dutch astronomer Jan Hendrik Oort has proposed that a "storage cloud" of comet material has accumulated far beyond the orbit of Pluto, and that the gravitational effects of passing stars may send some of the material towards the Sun, where it becomes visible as comets. Comets have long been regarded by the superstitious as portents of calamity or important events. The appearance of a comet has also given rise to the fear of collision between the comet and Earth. Earth has in fact passed through the tails of occasional comets without measurable effect. The collision of the nucleus of a comet with Earth would probàbly have catastrophic worldwide effects, but the probability of such an event occurring is exceedingly small. Some scientists suggest, however, that collisions have taken place in the astronomical past and may even, for example, have had a climatic role in the extinction of the dinosaurs. In 1992 the progenitor of Comet Shoemaker -Levy 9 produced 21large fragments following its exceptionally close approach to the planet Jupiter. During a week-long bombardment in July 1994, the fragments crashed into Jupiter's dense atmosphere at speeds of about 210,000 km/h (130,000 mph). Upon impact, the dissipation of their tremendous kinetic energy into heat led to massive explosions, some resulting in fireballs larger than Earth.*



参考译文

彗星是由一个轮廓十分清晰的彗核嵌入一个叫做彗发的星云状的云体里构成的，用肉眼看起来就像是一颗星星。关于彗星的构成有许多不同的理论。其中最出名的一个理论是美国天文学家弗雷德·惠普尔1949年提出的。他指出，彗星全部的质量实际上都在彗核上，彗核是一个由冰和灰尘组成的“脏雪球”。雪球理论的产生基于各种各样的数据。一方面，据精密观测，彗星所运行的轨道与它之前的运行轨道完全不相同。这点清楚地证明了逸出的气体产生了喷射作用，把彗星的彗核稍稍推离了预先的轨道。此外，对于短周期彗星公转的观察结果显示，随着时间的推移，彗星会渐渐地消逝，而这正是惠普尔提出的那种结构的彗星才会发生的事情。彗星的顶端，包括星云状的彗发，在体积上可能比木星还要巨大，有时候甚至会比太阳还要大。但是，大多数彗星的固体部分仅仅只有几立方千米。比如说，哈雷彗星的灰黑色的彗核只有约15×8千米(9×5英里)。

1577年，丹麦天文学家第谷·布拉赫证明了大型彗星实际上是天体，而在此之前人们一直认为大彗星的出现是大气现象。17世纪，英国科学家艾萨克·牛顿证实了彗星的运行与在其轨道上运行的行星是受同样的规律控制的。通过比较大量早期彗星的轨道要素，埃德蒙·哈雷指出1682年的彗星与1607年、1531年出现的两颗彗星是完全相同的，而且他成功地预言了彗星1758年的重新出现。目前已经被证实的关于哈雷彗星早前出现的记录可以追溯到公元前240年。哈雷彗星最近一次围绕太阳运行是在1986年年初。它在当年三月向外前行时，被两个前苏联建造的探测船织女一号和织女二号以及由欧洲航天局发射的被称为乔托号的探测器探测到。而且当它经过时，两艘日本航天器也远距离地观察到了。

当彗星接近太阳时，太阳的热量会蒸发或升华彗核里的冰，从而使彗星异常明亮。彗星也会产生一个或多个尾巴，有时彗尾会在太空中延伸几百万公里。彗尾一般背向太阳，即使是在彗星再次远离太阳的时候。彗星的气态尾巴往往是垂直并高度结构化的，由简单的电离分子构成，其中包括一氧化碳和二氧化碳。这些分子被太阳风以400公里/秒(250英里/秒)的速度吹离彗星，太阳风就是一股从太阳的最外围大气——日冕持续辐射出来的稀薄热气流。彗星也常常出现弯曲的尾巴，这个尾巴比表面上看起来要更加光滑，它是由太阳辐射压力从彗尾上吹下的微小尘埃组成的。当彗星远离太阳时，丢失的气体和尘埃会相对较少，而且尾巴会消失。一些小轨道的彗星尾巴太短，以至于实际上无法看到。而另一方面，至少有一个彗星的尾巴长度超出了32亿千米(20亿英里)。尾巴长度的不同以及它距离太阳和地球的远近程度决定了彗星的可观测性。记录在案的大约1,400颗彗星中，只有一小半彗星的彗尾能通过肉眼看见，不到十分之一彗星的彗尾比较明显。

彗星的轨道是椭圆形的，有200颗彗星的周期，即科学家们计算出来的它们绕太阳运行一圈所花的时间。恩克彗星的周期只有3.3年，1858发现的多纳蒂彗星的周期则长达2,000年，但大部分彗星的周期比这个还要长。大部分彗星的轨道都很宽大，以至于从一些能将其与太阳系分离的展开的曲线——抛物线上无法将它们识别出来，但是通过仔细的观察，天文学家发现，他们的轨道也是椭圆形的——尽管这个椭圆的离心率很大。这些彗星的周期据测是数百万年或几千万年。在距太阳的最远点的运行中，许多彗星的轨道明显地受到

了经过的天体，甚至是银河系引力作用的影响。已知的彗星中还没有一个能通过坚固的双曲线轨道接近太阳的，这就意味着星际空间中有一个太阳系之外的引力来源体。不过，有一些彗星可能会离开太阳系然后永远不会返回，因为行星的引力运动稍稍改变了原先的轨道。这种运动已经促使科学家们开展了一些小规模的观测。

当几个彗星同时在几乎相同的轨道上运行时，它们就被称为是彗星群。最著名的一个彗星群包括了壮观的掠日彗星、1965年出现的池谷-关彗星和其他七个周期长达千年的彗星。有人曾认为彗星来自星际空间。尽管关于彗星起源的详尽理论没有被普遍接受，现在许多天文学家相信彗星来源于太阳系寒冷的外层空间，由太阳系早期的行星残留物质形成。

核心词汇

comet ['kɔmit] *n.* 彗星
astronomer [ə'strɔnəmə(r)] *n.* 天文学家
hazy ['heizi] *adj.* 朦胧的，模糊的
atmospheric [ˌætməs'ferik] *adj.* 大气的
orbital ['ɔ:bitl] *adj.* 轨道的
evaporate [i'væpəreit] *vi.* 蒸发，使蒸发
sublimate ['sʌblimeit] *vt.* 升华，使升华
recede [ri'si:d] *vi.* 远去，向后退
dioxide [dai'ɔksaid] *n.* 二氧化物
corona [kə'rəunə] *n.* 日冕
radiation [ˌreidi'eiʃən] *n.* 辐射
naked ['neikid] *adj.* 赤裸的，无遮盖的
conspicuous [kən'spikjuəs] *adj.* 显而易见的，显眼的
elliptical [i'liptikəl] *adj.* 椭圆的
indistinguishable [indis'tiŋgwiʃəbl] *adj.* 难区分的，不能辨别的
parabola [pə'ræbələ] *n.* 抛物线
albeit [ɔ:l'bi:it] *conj.* 虽然，尽管
galactic [gə'læktik] *adj.* 银河系的
hyperbolic [ˌhaipə:'bɔlik] *adj.* 双曲线的
gravitational ['grævə'teiʃənəl] *adj.* 引力的
orbit ['ɔ:bit] *n.* 轨道
residual [ri'zidjuəl] *adj.* 残留的，剩余的
planetary ['plænitri] *adj.* 行星的

The Rise of British Sea Power

7. 英国潮汐能的崛起

机经选粹

这一篇讲的是英国利用潮汐发电。先追溯以前的发电方法，可能的潮汐发电站位置，潮汐发电的优势（比风能发电稳定，无空气污染），潮汐发电的结构和过程以及可能的问题等。

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The Rise of British Sea Power

A barge towing an inverted windmill to the mouth of Strangford Lough will launch a new programme to create sustainable energy. Geoffrey Lean, Environment Editor, reports.

Britain is set this week to enter a new age, generating energy directly from the seas that surge around its shores. On Saturday a strange, 122ft-long contraption—looking like an upside-down windmill—will set off from the Belfast dock that built the Titanic to produce the first electricity ever brought ashore from British tides.

The device—the first of its kind anywhere in the world—is expected to start a revolution which could lead to our island nation getting a fifth of its power from its surrounding waters, and to the far north of Scotland becoming "the Saudi Arabia of marine energy".

Remarkably, the pioneering device, which will start producing power from predictable and clean tidal energy, is the fruit of the vision and persistence of a single campaigning engineer, and has been developed by a small West Country firm. Though it has recently had some Government support, ministers have traditionally preferred to pour resources into much bigger projects, such as nuclear power stations. Indeed, the installation of the new device—near the mouth of Northern Ireland's Strangford Lough—is scheduled to take place only days after the Prime Minister, Gordon Brown, and the French President, Nicolas Sarkozy, are expected to sign a deal to jointly construct a new generation of reactors and to sell the technology around the world.

Yet the inauguration of a tidal turbine, dubbed SeaGen—which will generate enough electricity to power 1,140 homes by being placed directly in the tide race that rushes in and out of the lough—

may unexpectedly prove to be the more significant event. While the much-vaunted Severn Barrage has only just begun to undergo a two-year feasibility study, experts are hailing the new turbine as the start of a giant leap in exploiting marine energy, where Britain, for once, is now leading the world.

Later this year, in another global first, a wave energy power station developed by an Edinburgh firm is to be installed in the Atlantic Ocean off the coast of Portugal. Next year, an even bigger one, off Cornwall, is expected to start feeding electricity into the national grid, and yet another is planned for the Orkneys. And Marine Current Turbines, the firm behind SeaGen, has joined with the utility company npower to develop a tidal power station off Anglesey.

Britain has the best tide and wave energy resources in the world—the official Carbon Trust estimates that they could together provide a fifth of our electricity. Yet, until recently, successive governments have set their face against developing them.

In the 1980s the then Department of Energy killed off promising proposals for exploiting the waves amid evidence that it did so because they threatened its (never realised) plans to expand nuclear power. In 1992 an official report concluded that it "did not see any justification for significant public expenditure" on offshore energy, and as recently as 2003 a Government White Paper ruled out the development of a Severn Barrage.

The tide only turned decisively about a year ago when, as *The Independent on Sunday exclusively* reported, ministers began backing plans for the £14bn, 10-mile barrage. Gordon Brown officially announced a feasibility study at the last Labour Party conference, and this got under way in January.

Launching the study, which will continue until 2010, the Secretary of State for Business, John Hutton, described the barrage's potential as "breathtaking". But though it could alone provide 5 per cent of the country's electricity from a completely dependable, renewable resource, it could not be in operation until at least 2020.

And the Government's official environmental advisers—the Environment Agency, Natural England and the Countryside Council for Wales—have warned that the barrage would "cause irreversible impacts" to the estuary's "internationally important habitats" for wildlife and to its "unique ecology".

The scheme in Northern Ireland avoids these drawbacks by using a radically different technology. While the barrage impounds the rising tide behind a dam—letting it out, as it falls, through some 200 turbines in the structure—SeaGen sits in the tidal currents like an inverted windmill, capturing some of the energy by letting the water, rather than air, turn its sails as it flows.

While the barrage is a mammoth and expensive structure, which takes many years to build and then cannot be moved, the turbines can be constructed and sited relatively quickly, cheaply and flexibly. And while damming the Severn estuary inevitably fundamentally alters its ecology, SeaGen is expected to have far less impact on wildlife and the environment. But its technology's potential is no smaller. A report by the Sustainable Development Commission last year estimated that exploiting Britain's tidal currents could generate at least 5 per cent of the nation's electricity. Other authorities put it even higher.

Professor Stephen Salter of Edinburgh University, one of Britain's leading marine energy experts, estimates that the Pentland Firth alone could generate up to a quarter of Britain's electricity—more than is now being provided by all the country's nuclear power stations-making the channel between Orkney and the north Scottish mainland "the Saudi Arabia of marine energy."

Martin Wright, managing director of Marine Current Turbines, calls the Firth, the "Mount Everest" of the industry, and describes its tidal currents as "the equivalent of an underwater hurricane". Every second, about 2.5 million cubic metres of water—enough to fill 1,000 Olympic swimming pools—passes at a speed of up to 12 knots across a line traced across the Firth.

This is just the biggest of a host of potential sites, usually where the tides are speeded up by being squeezed through narrow channels, forming one of the most intense resources provided by any form of renewable energy. In all, the Government estimates, Britain has about half of all Europe's such "tidal stream" potential and between 10 and 15 percent of what has been identified worldwide, making it uniquely blessed.

Some 24 technologies, at various stages of research and development, have been put forward for exploiting tidal currents, but SeaGen—invented by Peter Fraenkel—a renewable energy pioneer who is now Marine Current Turbines' technical director is well in the lead.

In 2003 a smaller prototype, called Seaflow, was installed off Lynmouth in Devon becoming the first renewable energy device, powered by the sea, to be installed in the open ocean anywhere in the world. It operated through three winters, with regular force 8 gales, without any important technical failures—with an overall performance that exceeded expectations. Dr Fraenkel says it "proved the feasibility" of the technology.

He adds that SeaGen—four times as powerful, with a capacity of 1.2 megawatts—"is the world's first commercial scale system for generating electricity from marine currents"—and is "needed to prove economic and commercial feasibility".

Originally designed to be installed in 2006, it was held up by a series of events including the commercial takeover of the company due to install it, and an accident to a vessel due to carry it.

The latest delay occurred only last week, when bad weather held up the barge due to carry it from Belfast's Harland and Wolff shipyard to Strangford Lough, causing the installation—due for tomorrow—to be postponed. It is now expected next Monday.

It will be put in the 500m-wide Narrows at the mouth of the lough, where the currents exceed seven knots. This is a particularly important wildlife area, and so its operation will be closely monitored. The chief fear is that the turbines may damage marine mammals such as seals, but Dr Fraenkel says that they will turn too slowly, and that the animals are too nimble, for this to be a serious concern.

If all goes well, the company will then work with npower on the next development, a "tidal farm" of seven SeaGen devices, together capable of generating 10.5MW, in the Skerries of the North-west coast of Anglesey, which it hopes will start operating by 2012. It will be commissioned

from next month and go into full commercial operation in July.

Later in the year, Pelamis Wave Power, an Edinburgh-based company, is planning to install the word's first ocean-going wave power station—made of a series of tubes, each the size of a small commuter train, that bob up and down with the waves off the Portuguese coast.



本周，英国从环绕海岸的海洋中直接获取能源，从此英国进入了一个新时代。周六，一个奇怪的、122英尺长的装置，看起来有点像倒置的风车，将从建造泰坦尼克号的贝尔法斯特码头出发，首次从英国的沿海潮汐中获取电力。

这种在世界的任何地方都是首次出现的设备，有望引发一场革命，使英国这个岛国所需的五分之一的能量都能从它周围的水域中获取，苏格兰最北部的地区也将成为“海洋能源中的沙特阿拉伯”。

值得注意的是：这个将可预测到的清洁海洋潮汐能量中获取电力的开创性装置，是一位从事该项活动的工程师的先见之明和不懈坚持的结果，而它的开发是由西部一家小公司进行的。尽管这个项目目前获得了政府的一些支持，但从传统意义上讲，政府官员们一直以来更愿意把资源投入到核电站等更大的项目中。事实上，这个位于北爱尔兰斯特兰福德湾入口的新设备，其安装预计在英国首相戈登·布朗与法国总统尼古拉·萨科奇签订完合作建设反应堆并向世界出售该技术的协议的几天后实施。

然而，这款被称为“SeaGen”的潮汐涡轮机只要直接放在海湾来回翻涌的急潮中，其产生的电力就足够供1,140户家庭使用，这出人意料地成为更具意义的事情。而备受吹嘘的塞文坝项目仅仅是刚开始进行的一项为期两年的可行性研究，专家们一致认为，在开发利用海洋能源方面，新的涡轮机是一个飞跃的开端，英国正走在世界的前端。

英国拥有世界上最好的潮汐和海浪能源。碳基金公司的官员估计，全国五分之一的电力可以从这里获得。然而，到目前为止，历届政府都坚决反对开发这些能源。

在20世纪80年代，当时的能源部就取消了开发海浪资源的建议，有证据证明它这样做是因为海浪计划威胁到其扩充核能的计划(从来没有实现过)。1992年，一份官方报道推断，政府没有找到可以为海洋能源付出重大公共开支的理由，最近在2003年，一份政府白皮书也取消了塞文坝项目的发展。

据《独立报周日版》独家报道，直到一年前潮汐才变得具有决定性。当时政府官员们开始支持耗费140亿英镑、长达10英里的大坝计划。首相戈登·布朗在上次劳工党会议上正式宣布了可行性研究，并于1月份正式开始实施。

这项研究将一直进行到2010年。英国商务大臣约翰·赫顿认为拦河闸具有惊人的潜力。虽然它可以从完全可靠的再生资源中单独为该国提供5%的电力，但是它至少要到2020年才能运作。

环保局，自然英格兰和威尔士乡村委员会作为政府的环境顾问警告说：“拦河闸

将对河口的国际性重要动物栖息地及其独特的生态环境造成不可逆转的影响。”

北爱尔兰的计划则通过采用完全不同的技术避免了这些不足。拦河闸将上涨的潮水贮于大坝后，当水下降的时候再将之放出，通过对200个设在像倒置的风车一样的水流中的SeaGen涡轮机放水来获得部分能量，而不是像空气，在流动的时候就带动帆。

拦河闸是庞大且费用浩大的建筑，需要修建多年，并且建好后无法移动，而涡轮机的构建和安置相对迅速、廉价，并且灵活。在塞文河口筑坝必然会对生态系统产生根本性的影响，而SeaGen对野生动物与环境的影响要小很多，但是其技术的潜力并没有丝毫减小。据可持续发展委员会去年的一份报告估计，开发英国的潮汐激流至少能够供应全国5%的电力。其他的权威机构对此估计更高。

爱丁堡大学的斯蒂芬·萨尔特教授是英国重要的海洋能源专家之一。他估计，仅仅是彭特兰湾就可生产全国四分之一以上的电力，这比目前整个国家所有的核电站所提供的电力还要多，这将使奥克尼和北苏格兰大陆之间的海峡成为“海洋能源中的沙特阿拉伯”。

海流涡轮机有限公司的总经理马丁·赖特将河口比喻成“珠穆朗玛峰”似的产业，并将潮汐描述为“水下飓风”。每秒钟约有250万立方米的水，以高达12海里的速度穿过河口，这些水足够装满1,000个奥林匹克的游泳池。

这仅仅是许多潜在的位置中最大的一个，通常情况下狭窄的渠道会使潮汐加速，从而形成最密集的资源之一，而这种资源是可以从任何形式的可再生资源中获得的。据政府估计，英国总共具有大约欧洲一半的潮汐河流，这使英国受到了特别的保佑。

在不同阶段的研究和发展过程中，大约有24种技术已经开始用来开发潮汐流，而新型潮汐能涡轮发电机的技术总监彼得·弗伦克尔，是开发利用可再生资源的先驱，他发明的SeaGen理所当然处于主导地位。

2003年，一个被称为Seaflow的小的原型成为首个可再生能源装置，它安装在丹佛的小康林茅斯，由海洋提供能量，可以安置在世界上露天海洋的任何地方。它是靠三个冬天里的八级狂风运转的，没有任何技术上的重大失误，它的完整运作超出了预期。弗伦克尔博士说它证明了技术的可行性。

在今年稍后的时间里，一家以爱丁堡为基地的公司“海蛇号海浪能”计划安装世界上首个海洋潮汐能站，这个工作站是由一系列的管道组成，每根管道都和一列小型通勤车一般大，这些管道将随着葡萄牙岸边的海浪上下摆动。

核心词汇

surge [sə:dʒ] *vi.* 汹涌，澎湃
contraption [kən'træpʃən] *n.* 装置
windmill ['windmil] *n.* 风车
ashore [ə'ʃɔ:] *adv.* 在岸上，向岸
marine [mə'ri:n] *adj.* 海的，海上的
installation [ˌinstə'leiʃən] *n.* 安装，装置
tidal ['taidl] *adj.* 潮的，潮水的
turbine ['tə:bin] *n.* 涡轮
vaunted ['vɔ:ntid] *adj.* 吹牛的，吹嘘的
feasibility [ˌfi:zə'biləti] *n.* 可行性
successive [sək'sesiv] *adj.* 接连的，连续的
barrage ['bærɑ:ʒ] *n.* 拦河坝
radically ['rædikəli] *adv.* 根本地，完全地
underwater ['ʌndə'wɔ:tə] *adj.* 水下面的，在水中的
uniquely [ju:'ni:kli] *adv.* 独特地，唯一地



Time Lapse Photography

8. 延时摄影

机经选粹

这一篇讲的是摄影技术，第一段是介绍；第二段说隔一段时间曝光一次，可以把蘑菇的生长过程记录下来，然后用几分钟播放出来；第三段说的是用快速拍摄把一种鸟在几秒内做完的事延长播放出来。

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Time Lapse Photography

Time lapse photography is a cinematographic technique in which each frame of the picture is captured as a much lesser speed as compared to the speed it will be played back. This in turn gives an effect of the picture moving much faster than it actually is. This effect can be termed as the lapsing of time, hence the term 'Time Lapse' photography.

Time lapse photography was first used by Georges Melies in his motion picture, 'Carrefour De La Opera' in 1897. It was later used by F. Percy Smith and Roman Vishniac till 1918. Time lapse photography was also used extensively by feature films called Bergfilms. Most notably, time lapse photography was used in 'The Holy Mountain' in 1926.

Time lapse was generally used for films about biology and science, and mostly used in sequences of plants growing, flowers opening, fruit rotting or celestial motion. It was also used in sequences of a building being built, or people moving around in a city.

To understand the working of time lapse, one would have to know a bit about filming and photography. The general speed of moving film is 24 frames per second. If the camera is set to record at a speed lower than 24/s, the speed of projection will still be 24/s. Therefore, the image will be seen moving faster than it actually was. The frame rate of the camera can be set to any difference, starting from the normal 24 to 30 frames per second to even one frame a day.

Therefore, Time lapse photography is a series of photos taken over a large period

of time, shown together and assembled into a movie. Time lapse technology was later used extensively by Dr. John Ott and later by the Oxford Scientific Film Institute in Oxford England. Though time lapse started as a hobby for Dr. Ott, he later started building more and more time-lapse machinery and gadgets. Dr. John Ott was devoted to this technology and had come up with wonderful examples of what time lapse technique could do. He also wrote a book about his experiences, titled 'My Ivory Cellar'. He had shot his entire greenhouse and the other cameras in the greenhouse. Dr. Ott also shot movies of plants moving and gyrating to pre-recorded music using time-lapse technology. His work was later used in documentaries like Walt Disney's 'Secrets of Life' in 1956.

Since then, time lapse photography has been used in countless television programs and movies. Recently, shows like the Benny Hill Show has used time-lapse photography at the end of every of their episodes. Recently, the movie 'A Zed and Two Noughts' by Peter Greenway had used a sub-plot featuring time lapse. Time lapse was also used very recently in 'Early Edition'.

Perhaps time lapse technology was most used in the 1995 plants documentary, 'Private Life of Plants' by David Attenbough. Until a few years ago, the costs of shooting time lapse photography was enormous and therefore out of the common man's hands. However, today time lapse photography can be created with the simple equipment of a digital camera, a computer and proper movie editing software. Some cameras also offer time-lapse software, generally called 'remote software'.

A simple way of taking time-lapse photography is to set the camera to focus the object, set it to take a photograph every three or five seconds, and get the photographs. The photographs can then be put together in a movie-editing software. The sequence of pictures should run at the speed of one frame per second. To have better time-lapse photography, you can focus on the clouds, or a flower opening, or even people moving along on the street. Make sure that the object and the action is big enough to be noticed.

参考译文

延时摄影是一种以比图片播放速度慢得多的速度来获取图片的每一个框架的摄像技术。这样可以达到使图片运动速度比实际速度更快的效果。这种效果可以称作为时间间隔，因此出现了延时摄影这个术语。

乔治·梅里埃于1897年在他所拍摄的电影《剧院的交叉路口》中首次运用延时摄影技术。直到1918年延时摄影才被珀西史密斯和维胥尼亚使用。延时摄影还被大量运用于名叫伯格电影的故事片中。最著名的是1926年的《圣山》中也使用了延时摄影技术。

延时摄影通常被用在关于生物科学的电影中，而且大部分用在植物生长，花朵盛开，水果腐烂或者天体运动的连续演变及运动过程中。延时摄影还被用于修建建筑物或者城市中人们行走的连续运动过程中。

想要了解时间间隔的执行过程，就必须知道一些电影和摄像的相关知识。动态影片的一般速度是每秒24帧，如果摄影机中设置的速度低于每秒24帧，投影的速度将仍然是每秒24帧。因此画面看起来就比实际运动的快一些。摄影机的帧频可以设置到任何不同的频率，从正常的每秒24—30帧到甚至每天一帧。

因此，间隔摄像是将花了大量时间拍摄到的一系列图片显示出来并聚集到一部电影中去。间隔摄像后来被欧特博士大量运用，接着被英国剑桥的剑桥科学电影研究所使用。尽管延时摄影一开始是作为欧特博士的一个爱好产生的，但后来他开始越来越多地建造时间间隔机械和小配件。欧特博士致力于这项技术研究，并且提出了一些很好的例子来说明时间间隔技术何时才能使用。他还写了一本介绍其经验的书，书名是《我的象牙地窖》。他曾经拍摄了他的整个温室和温室中的其他摄影机。欧特博士还在拍摄植物的电影中运用延时摄影技术对电影画面的移动和回旋配上预先录制的音乐。他的工作成果后来被运用于1956年中诸如沃特·迪斯尼的《生命的秘密》这样的纪录片里。

从那以后，延时摄影被用于不计其数的电视节目和电影中。近来，一些节目，像本尼·希尔秀，在他们每段情节的结尾部分运用了间隔摄像技术。最近，由彼得·格林纳威拍摄的影片《一个Z和两个O》也安排了以时间间隔为特色的次要情节。在最近的《早报》也运用到了延时摄影。

也许延时摄影最频繁的使用是在1995年由大卫拍摄的《植物的私生活》的植物纪录片中。直到前些年为止，间隔时间摄影的成本还都是巨大的，超出了一般人的能力范围。然而，今天的间隔摄像只要通过一台数码相机、一台电脑和适当的电影编辑软件的简单设备就能实现。有些摄影机还提供时间间隔软件，通常称为“遥控软件”。

延时摄影的一个简单途径就是将照相机聚焦在物体上，使其每隔三或五秒钟拍摄一张照片并取出来，然后将这些照片一起放进电影编辑软件。图片的连续运动过程应该以每秒一帧的速度运行。要想更好地延时摄影，可以聚焦到云彩或者盛开的花朵甚至是街道上行走的人群。拍摄对象和动作务必要足够大，以便能够被注意到。

核心词汇

cinematographic [ˌsiniˌmætə'græfik] *adj.* 电影的，电影摄影术的
frame [freim] *n.* 框架，结构
capture ['kæptʃə] *vt.* 抓取，获得
term [tə:m] *vt.* 称，呼
feature ['fi:tʃə] *n.* 电影中的正片，故事片
sequence ['si:kwəns] *n.* 序列，顺序
rot [rɔt] *vt.* 腐烂，腐蚀
projection [prə'dʒekʃən] *n.* 发射
assemble [ə'sembl] *vt.* 聚集，集合
machinery [mə'ʃi:nəri] *n.* (总称)机器，机械
gadget ['gædʒit] *n.* 小机件
gyrate ['dʒaiərit] *vt.* 旋转
documentary [ˌdɔkju'mentəri] *n.* 纪录片
episode ['episəud] *n.* 插曲，插话
edit ['edit] *vt.* 编辑，编校
software ['sɔftwεə] *n.* 软件

FLIP—Research Vessel

9. 浮动水文观察平台——考察船

机经选粹

这一篇比较了两种可以探测海底的船。一种是flip ship，一种是hinge ship。文中讲了flip ship的构造实现，以及finge ship的改装花费问题。有了这两种海底探测船，人们可以在海下进行试验，实现在海下旅游的梦想。

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FLIP—Research Vessel

FLIP (Floating Instrument Platform) is the US Navy's oldest, and most unusual, research vessel.

Commonly referred to as the FLIP ship, it is actually a 355ft long, spoon-shaped buoy which can be flipped from horizontal to a vertical position by pumping 700t of seawater into the "handle" end whilst flooding air into the "cradle", causing it to rise up out of the sea.

Once the 28 minute transformation from horizontal to vertical has taken place, 300m of the buoy are submerged underwater, keeping the 700 long-ton mass steady and making it perfect for researching wave height, acoustic signals, water temperature and density, and for the collection of meteorological data.

FLIP was created in 1962 by scientists Dr Fred Fisher and Dr Fred Spiess, who wanted a more stable space than a conventional research ship to study wave forms. The build was funded by the US Office of Naval Research (who still own the buoy) and the Marine Physical Laboratory of the Scripps Institution of Oceanography (who still operate it) and launched by The Gunderson Brothers Engineering Company of



Portland, Oregon.

FLIP was given a $2m makeover in 1995 and currently resides in La Jolla, California, although it operates all over the world. The buoy has so far completed over 300 operations.

The Flip Transformation

The transformation from horizontal to vertical is one of the most impressive sights on the ocean. Because of the potential interference with the acoustic instruments, FLIP has no engines or other means of propulsion, so it has to be towed out to sea. In tow, FLIP can reach speeds of 7-10 knots.

When it has reached its desired location, it either drifts freely or is held in place using one or all of its three anchors. The long, thin end of the buoy has special ballast tanks, which are then flooded with seawater, causing it to sink, whilst air tanks cause the other end of the buoy to rise. The protruding end is equivalent in height to a five-storey building.

FLIP can operate equally well in shallow water or depths of over 2,000 fathoms. Once the 300ft of buoy is submerged the vessel is so stable it is almost unaffected by vertical wave motion.

A 30ft wave only causes FLIP to move three feet vertically in the water column. Although this is the size of wave the buoy was built to withstand, FLIP can cope swells of up to 80ft.

For FLIP to flip back to a horizontal position, air compressed into eight tanks is used to push the seawater out of the ballast tanks. The submerged end of FLIP rises until the buoy is once again level with the water.

Flip Ship Design

FLIP's unique design makes it the only vessel in the world capable of operating both horizontally and vertically. Scientific instruments are built sideways into the wall so that as the buoy flips, the instruments flip into a usable position as well.

Most rooms on FLIP have two doors; one to use when horizontal, the other when FLIP is vertical. Bunk beds, toilets and stoves are built on swivels and gimbals, so they will turn along with the buoy, but things that would not rotate so well, like sinks, are built both horizontally and vertically in each room.

The main power source comes from two 150kW generators with one 40kW generator for backup. Navigation equipment includes a gyro, GPS and RADAR. Communication equipment includes HF, VHF, INMARSAT and cellular.

Life on Board

Life for the five crew members and 11 researchers who can live on-board FLIP at any one time is not for the faint-hearted. Stays in the cramped conditions last for 30—45 days and, during the flip, everyone has to stand on deck whilst the deck below them gradually becomes a bulkhead, before stepping onto a deck that was a bulkhead just minutes before.

"The last 15° of movement prior to arriving in the vertical happens quickly and is reasonably exciting as the exterior decks where everyone is positioned appear to be heading into the sea," says Captain William A Gaines, assistant director of Marine Physical Laboratory at Scripps Institution of Oceanography.

"The crew and riders remain on the external decks during the flipping evolution. The lowest exterior is about 15ft above the waterline when FLIP is in the vertical. There is lots of noise as the remaining air from the ballast tanks escapes from the vent lines located on the lowest external deck."

Once the transformation has occurred, staff have to cope with working five storeys above the ocean; contending with steep stairs, narrow booms and the confined spaces necessary to make FLIP operational.

"The habitability conditions on FLIP at sea can best be described as austere," says Captain Gaines.

"Because of the combined spaces, there is limited privacy. There are two heads (bathrooms) onboard, two showers, but only one that can be used in the vertical and one that can be used in the horizontal. With 16 persons and one shower, Sunday showers are not permitted."

"It does take a special person to serve on FLIP. However, many scientists and science party members prefer conducting science from FLIP over being embarked in a conventional research ship because of the stability that FLIP offers. The small crew on FLIP creates a feeling of family and cohesiveness. The Officer in Charge of FLIP, Tom Golfinos, has been onboard for 17 years."

Hinge-Ship

Hinge-Ship is a patented concept designed to combine the advantages of both deep draft and shallow draft shipping within the confines of a single vessel. The concept, if proven viable, could help to further the mandate of shaving valuable time from the transportation of goods from "point A to point B," as it would literally eliminate the need for storage at transshipment points and the transfer of cargo to other vessels, and all of the time and cost inherent in both. The essence of the design is that the vessel is

split on centerline, and provided with a hinge.

This arrangement, according to its designer John H. Leary, P.E., of Leary Engineering in New Orleans, allows the two separate port and starboard hulls to rotate relative to each other and thus alter, for a given displacement, the vessel's waterplane area and draft.

Applications for the concept include dry bulk cargo, liquid bulk cargo, trailers and military vehicles. The "Hinge". The rotation of the two hulls about the hinge is accomplished by using the beam and gear mechanism. This operation is greatly assisted by using water ballast in the double bottom spaces under the cargo compartments. Each double bottom is divided by a watertight longitudinal bulkhead at its center. Because the forces encountered in inland waters are relatively small, the hinges and beams alone are able to resist relative movement between the two hulls. However, the vessel's two hulls are brought together in the deep-draft configuration before it goes to sea. This engages the aligning devices (pyramids and sockets), which along with the beams and hinges, resist the longitudinal and vertical forces encountered at sea. Additional analyses confirmed the ability of the hinges to resist hull torsion at sea. The materials selected for the hinges and bearings are resistant to corrosion and binding. Economies of Scale. The advantages of owning and operating a vessel, which could readily transform from a deep draft configuration to a shallow draft arrangement are rather obvious in terms of savings of time and money. While the jury is still out regarding a potential owner/operator's view on having a hinge on its vessel, with all of the safety and maintenance questions that come with it, Leary presents a strong case for a radical design, which could well fit the transportation bill of future generations. For example, the vessel offers economies not only to the owner operation, but also the shipbuilder, as the design concept can be built using barge building techniques at relatively small shipyards.

The design calls for a deck, bottom and shell consisting almost entirely of stiffened flat plate and chines. The bow and stern are raked and resemble river barge rakes when the vessel is in its shallow draft mode. However, these rakes are shaped so that the bow and stern more closely resemble those of a ship's seagoing form when the vessel is in its deepdraft mode. these features are evident in the drawings of the vessel and in the photographs of the model. The Initial Design Drawings depicted throughout the ensuing pages depict a vessel of both a self-propelled (ship) and non-self-propelled (barge) version. The initial offering is of a vessel that would be suitable for the Mississippi River system, but should be duly noted that they are transferable for other dimensions and proportions as well. The principal dimensions of the prototype Mississippi River system vessel are: Length 595 ft. (181.3 m) Breadth 105 ft. (32 m) Draft (inland) 13 ft. (3.96 m) Draft (ocean) 28 ft. (8.5 m) Cargo (ship) 12,400 long tons Cargo (barge) 13,200 long tons The vessel is capable of carrying additional cargo in its ocean configuration as follows: Draft 34 ft. (10.4 m) Cargo (ship) 21,000

long tons Cargo (barge) 21,800 long tons The 595 x 105 ft. (181.3 x 32 m) dimensions noted above—selected for a vessel operating on the Mississippi River system—are equivalent to nine (3x3) standard 195 x 35 ft. (59.4 x 10.6 m) or 200 x 35 ft. (60.9 x 10.6 m) river barges. The ship version is designed to navigate anywhere a tow of nine barges can navigate. Either the barge or the ship versions can be placed in a tow of standard barges being pushed by a standard towboat. The vessel's dimension also allows it to transit existing locks on the Mississippi inland river system. In addition, standard ocean tugs can tow the barge version at sea, and of course, the ship version can sail under its own power.

Main propulsion machinery is designed to consist of electric Z-drive units, one port, one starboard. The steerable units, complete with propeller nozzle, would provide the maneuverability need in shallow drafts as well as the propulsive force needed in deepdraft mode. The electric motors are designed to be located in the aft machinery flat above the Z-drive units. In either draft condition, the propellers are above the baseline protected from damage by grounding. This propulsion system combined with the stern hull shape eliminates the need for flanking rudders. The Many Modes of Hinge-Ship Hinge-Ship is designed as a multi-functional and convertible vessel, which will help ship owners and operators meet a variety of needs in a safe, efficient and cost-effective manner. The following are details of the vessel types designed to date. Dry Bulk Carrier Each cargo hold has a large hatch with hydraulic operated hatch covers. In deep draft condition, the hatch openings are parallel to baseline and fully accessible for standard loading and unloading elevator equipment. In shallow draft mode, the inboard hatch coaming is sloped somewhat increasing the clear hatch opening. Loading the vessel in this condition is accomplished using standard grain elevator loading equipment. In this version, the aft house remains parallel to baseline while changing draft configurations. This allows ship's personnel to continue their operating duties without experiencing irregular deck movement. Trailer Transport The general hull design, propulsion and operating advantages are identical to that of the bulk cargo ship. The hold deck and the 'tween deck provide trailer stowage, separated by watertight transverse bulkheads. The hold deck has eight rows of trailers. Each row of trailers is positioned by deck guide rails located between dual tires. The hold deck and tween deck provide trailer stowage, separated by watertight transverse bulkheads. The tween deck has four rows of trailers throughout the cargo area, also separated by watertight transverse bulkheads.

Trailers are driven (using a special handling tractor) on the vessel via the side ramp into the positioning area where each trailer is aligned and backed into one of the rows. In ocean service, when the stowage decks are angled, the trailers are secured from athwart ship movement by means of mechanical jacking clamps. The jacks are aligned at the trailer bed and at the trailer top. Individually the trailers are positioned,

and secured. Fore and aft movement is restrained by standard cargo lashing from deck fittings to trailer bed at both ends of the trailer. Military As a military transport, the vessel is capable of carrying a variety of rolling vessels and offers the advantages of trans-oceanic transportation with shallow water bow unloading. Beach landings are possible in the shallow draft condition, with side ramps port and starboard for loading and unloading. A standard compartmentized ballast system provides the needed trim for beach approach, and subsequent withdrawal. Welcome "LoJack" For Ships Epic proportions of automobile theft in the United States led to the creation a few years ago of an innovative product dubbed Lo-Jack, which is essentially a hidden transmitter placed in the vehicle which, when activated by a call of a stolen vehicle to the police, allows them to track the vehicle rather quickly. The same concept was recently rolled out for ships, particularly targeting owners operating vessels in areas of high piracy activity.

Piracy is a serious threat to ships and the personnel that crew them. With pirating activities running rampant in some parts of the globe—particularly the Far East—organizations from the International Maritime Organization (IMO) on down are devising means and methods to keep ship and crew safe.

CLS, a satellite-based company believes it has the product—one that relies on high-tech electronics and satellite communications—to help locate and recover ships in the event of a hijacking. The company has therefore created Shiploc, a new device developed in conjunction with the International Maritime Bureau (IMB), which is a major component in the fight against these acts of violence on the high seas. This small device, which is the approximate size of a shoebox can easily be hidden anywhere on a ship. Installed per the vessel's owner, who can track its position at any time via Shiploc, the system is unbeknownst even to the ship's master and crew for extra precaution. Since, according to P.K. Mukundun, IMB's director, "a vessel can move up to 15 positions a day," the owner can track its movement with Shiploc via Internet access on a personal computer.

While the number of pirate attacks, according to the IMB has declined during the last year, it has also been reported that there is a steady rise in crewmembers being injured or killed during these attacks.

Available in both normal and crisis mode, Shiploc allows vessel owners to track the positions of their ships through the Web site. Using a confidential user name and password, owners log on to the site, and are able to check the whereabouts of their vessels through a clear and concise map plotting each position through the device's dedicated software called Elsa. When set in normal mode, Shiploc can also alert owners through both e-mail and the Web site as to whether their vessel arrived safely at its expected destination. If the owner logs on and finds that his vessel has gone

off course, he can then kick the system in to crisis mode, which will alert IMB's Kuala Lumpur headquarters of a possible hijacking. . Once data is received by IMB's piracy reporting center, the Bureau, after accessing the ship's position data, will inform the local law enforcement agencies and coordinate all necessary action to ensure the safety of the crew and the vessel's recovery.

Running on the ship's power supply, Shiploc includes its own back up for extra protection, in case the vessel's power is cut off during a hijacking. Despite a power shutdown, a vessel equipped with the safety system will still be able to send data via the transmitter. Shiploc is designed specifically for the maritime industry, and is available to owners for $280 a month including cost of satellite messages. Mukundun reports that so far more than 60 units have been installed on various types of vessels internationally, and are continuing to climb steadily on a consistent basis. Internet@ Sea.

Barriers to communication between ship-to-ship and ship-to-shore are quickly dissolving with the break-neck speed at which the communications industry worldwide is expanding capabilities and service. Cruise ships—which cater to millions of individuals who increasingly find taking a full break from the "real" world tough if not impossible—are perfect trying grounds for communications solutions, both as a value-added benefit for communication craving guests and as a revenue generation opportunity for cruise lines. Maritime Telecommunications Network (MTN) and Digital Seas International (DSI) have executed a three-year contract to provide Renaissance Cruises' entire fleet with Internet Cafés. MTN, a leader in maritime telecommunications and a subsidiary of ATC Teleports Inc., will supply the cruise line with the high-speed IP satellite network to operate DSI's Internet services. After a successful trial between MTN and DSI on the R2, Renaissance Cruises decided to offer Internet services fleet wide for their guests. The present fleet was to be outfitted with the Internet services and Cafés by the end of August 2000.

"We are pleased to be the link between our partner, DSI, and the youngest fleet in the cruise industry, Renaissance Cruises," stated Dave Kagan, president and chief executive officer, MTN. "This gives us the opportunity to deliver an all-inclusive telecommunications system including voice, data, and now Internet."

"We are happy to meet our guests' demands. This means wiring our entire fleet with affordable Internet services and delivering the high-speed connectivity our guests are used to," said Stacy Shaw, manager of revenue operations, Renaissance Cruises. "MTN and DSI share our vision of complete customer satisfaction and we are assured that our new Internet Cafés will be an added value to our guest's experience aboard Renaissance Cruises."





浮动水文观察平台(FLIP)是美国海军最古老、最独特的考察船。

这种船一般被称为浮动水文观察平台船，实际上是一个355英尺长、汤匙型的浮标，通过把700吨的海水抽到“柄”端，同时将溢流气体抽到“支船架”，这样它便能从水平位置翻转到垂直位置，从而竖起来伸出大海。

一旦发生了从水平向垂直的28分钟的转变，浮标有300米就都会淹没于水下，保持自身700长吨的主体稳定，以便于理想地研究海浪高度、水声信号、水温和密度，以及收集气象数据。

浮动水文观察平台于1962年由科学家福瑞德·费歇尔博士和福瑞德·史比斯博士创建。他们想要一个更加稳定的空间而不只是一个传统的实验船来研究海浪的形式。该建筑由美国海军研究所(现在仍然拥有该浮标)和斯克里普斯海洋研究所的海洋物理实验室(仍在经营)资助，并由俄勒冈州波特兰市的冈德森兄弟工程公司开船下水。

1995年，浮动水文观察平台获得了200万美元的翻新资金。尽管其工作范围遍布全球，但目前仍驻在加利福尼亚州的拉霍亚市。迄今为止，浮标已完成300桩以上的操作。

从水平向垂直的转换是海洋上最令人难忘的景观之一。因为声学仪器潜在的干扰，浮动水文观察平台也没有引擎或其他的推进方法，所以它必须被拖到海上。在被拖着的过程中，浮动水文观察平台的速度能达到7~10海里。

当它达到既定的位置时，就可以放任逐流，也可以用它的一个或所有的三个锚将其固定在适当的位置。浮标长而细的末端有专门的压舱槽，用于注满海水，使它下沉，而气槽则使浮标的另一端上升。突出水面的一端的高度相当于五层楼建筑的高度。

浮动水文观察平台在浅水或超过2000英寸的深度同样能运行得很好。一旦300英尺的浮标浸没于水中，船就会很稳定，几乎不受垂直波动的影响。

30英尺的海浪只会让浮动水文观察平台在水柱中纵向移动3英尺。虽然这是浮标建造时能承受的海浪强度，但它却连高达80英尺起伏的波浪都能应付得来。

为了让浮动水文观察平台翻转回水平位置，要让被压缩到8个槽的空气把海水推出压舱槽。直到浮标再次与水相平，浮动水文观察平台下沉的一端才会升起。

浮动水文观察平台独特的设计使它成为世界上唯一一艘能在水平和垂直时都能工作的船只。科学仪器建在墙的侧面里，以在浮标翻转时，它们也翻转到一个适用的位置。

浮动水文观察平台的大多数房间都有两扇门：一个在浮动水文观察平台处于水平位置时使用，一个在垂直时使用。双层床、卫生间和烘房建在转环和平衡环上，因此会随着浮标转动，但是有些不能很好地旋转的，比如水槽，就在每个房间里都修建有水平的和垂直的。

主要能量来源于两个150千瓦的发电机和一个40千瓦的备用发电机。导航设备包括回转仪罗盘、环球定位系统和雷达。通信设备包括高频、甚高频、国际海事通信卫星和蜂窝式无线通讯技术。

铰链船是一种专有概念，它旨在结合单一船只行进时在吃水范围内吃水深和吃水浅的各自优势而设计的。如果这个概念证明可行的话，就能帮助满足促进削减“从A点到B点”

运输货物所需的宝贵时间的要求，因为它的确能消除在转运点存贮货物的需要和把货物转移到其他船只的需要，以及所有这些过程必须花费的时间和成本。设计的精髓就是：船只沿中线分裂，并由一个铰链连接。

根据其设计师，新奥尔良的利里工程的专业工程师约翰·H·利里所述，这项安排使两个单独的港口和右舷船体相对旋转，从而在一个特定的位移，改变船只的地下水域和吃水程度。

对此概念的运用包括干散装货、流质散装货、拖车和军用车辆。"铰链"——两个船体的旋转通过使用横木和齿轮机完成。这项操作很大程度上要借助于货物舱下双层底位中的水压舱。每个双底层由沿中心纵向放置的防水墙分开。由于遇到的向内的水的压力相对较小，仅铰链和横木就能抵抗这两个船体之间的相对运动。然而，船在进入大海之前，两个船体以深吃水船的构造结合在一起。这使与横木和铰链一起的调整装置(角锥和狭槽)能抵抗在海上遭遇的纵向垂直的压力。其他的分析证实了铰链具有抵抗海上船体扭转的能力。铰链和轴承所选定的材料要耐腐蚀、具有黏合性。规模经济效应——船可以随时将吃深水结构转化成吃浅水安排，拥有和经营这艘船的优势在节约时间和金钱上相当明显。评审委员会仍然对潜在拥有者/运营者在船上安装铰链的观念持反对意见。面对随之而来的安全和维修问题，利里为一个激进的设计陈述了一个强有力的例子，这个设计能很好地适应后代的交通条例。例如，该船不仅为运营业主，还为造船公司提供了实惠，因为其设计观念能在相对较小的造船厂里运用驳船建筑技术来实现。

核心词汇

cradle ['kreidl] *n.* 支船架
buoy [bɔi] *n.* 浮标
oceanography [ˌəuʃiə'nɔgrəfi] *n.* 海洋学
tow [təu] *vt.* 拖，曳
anchor ['æŋkə] *n.* 铁锚
ballast ['bæləst] *n.* 压载物，压舱物
swivel ['swivl] *n.* 转环，旋转轴承
gimbal ['dʒimbəl] *n.* 平衡环
mandate ['mændeit] *n.* 命令，指令，要求
transshipment [træns'ʃipmənt] *n.* 转运，中转
centerline ['sentəlain] *n.* 中线
starboard ['stɑ:bəd] *n.* (船、飞机的)右舷
watertight ['wɔ:tətait] *adj.* 不漏水的(无懈可击的)
longitudinal ['lɔndʒi'tju:dinəl] *adj.* 经线的，纵向的
bulkhead ['bʌlkhed] *n.* 防水壁，分壁
configuration [kənˌfigju'reiʃən] *n.* 结构，布局，形态
torsion ['tɔ:ʃən] *n.* 扭转，扭力
corrosion [kə'rəuʒən] *n.* 侵蚀(腐蚀，锈)
shipyard ['ʃipjɑ:d] *n.* 造船厂

Cellphones in Flight Face Technical and Social Hurdles

10. 飞机上使用手机面临着技术障碍和社会障碍

机经选粹

这一篇是讲移动电话是否对飞机有影响，认为移动电话不允许在飞机上使用，是因为影响通信信号，造成危险，还是为了让人们用飞机上的电话。人们对此有不同意见，并且做了不少实验，给了一些建议，列举了几个组织的观点或看法什么的。说飞机上能使用手机的，有CAC、BOEING等5家公司。每家公司的意见其实差不多，都认为手机对飞行的危害不大。

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Cellphones in Flight Face Technical and Social Hurdles

Business travelers who think there are not enough hours in the day, take note: in two years there may be a few more at your disposal.

In 2006 the nation's commercial airliners may begin to allow passengers to make cellphone calls and connect to the Internet throughout a flight. No longer will passengers have to cram in their last cellular calls before takeoff. Instead, they will be able to use standard mobile phones to make and receive calls while in flight.

Technical and social issues must still be worked out. The airlines, the Federal

Aviation Administration and the Federal Communications Commission must be assured that cellphones will not interfere with navigation or communications equipment. And the airlines also must devise ways to avoid conflict between cell yellers and passengers looking for a quiet trip.

While the airlines wait for government approval, Lufthansa currently offers Internet access on some international flights. As a foreign carrier, it is not subject to federal restrictions.

"A circle of mobility defines how people want to work and live today," said Monte Ford, senior vice president of American Airlines. In July, the airline conducted a test flight in which passengers could place calls throughout the United States without interfering with the plane's operations.

"Cellphones and laptops are used in cars and offices, but the missing piece has been the airplane," Mr. Ford said. "But it's critically important that this technology be utilized in a proper way."

Airline passengers have been able to make calls during flights for years, using telephones built into seat backs. But high cost and poor connection quality have discouraged their use.

Until now, there have been concerns that cellphone use during flight could disrupt cell networks or interfere with the plane's navigation systems. The F.C.C., which has jurisdiction over ground communication, forbids the use of cellphones in flight out of concern that passengers calling from the air could overwhelm the nation's system of cell towers. That policy is currently under review and is likely to be modified this October, according to Lauren Patrich, an F.C.C. spokeswoman.

For its part, the F.A.A., which governs in-flight communications, recommends that airlines forbid the use of any device—including cellphones and pagers—that transmits signals, because of the risk of interference.

Two newly proposed solutions will allow passengers to use their own cellphones to place calls in flight in a way that their makers say addresses both concerns. Unlike the current seat-back phone system, airlines will not have to pay for costly interior wiring. Instead, a small cell tower, known as a picocell, will be installed inside the cabin. Cellphone signals will be picked up by that cell, and then, depending on the system, relayed either first to a satellite or directly to the ground.

AirCell of Louisville, Colo, a large provider of in-flight communications services, has proposed a system that would bypass existing cellphone towers on the ground and direct calls instead to a separate grouping of receivers installed throughout the country. Equipment inside the plane would effectively create a cabin-wide hot spot handling voice and Internet communications.

The AirCell system can handle any of the three digital phone standards in use by the American carriers: C.D.M.A., T.D.M.A. or G.S.M. Signals from each phone would be received by the plane's picocell, and then translated into one digital signal that would be sent to one of AirCell's terrestrial receivers. To keep costs down, those receivers could be situated next to ones operated by cellphone carriers. The signals would be separated and sent to the customer's carrier for routing and billing.

The system is designed to be able to transmit signals a distance of 50,000 feet, and hand them off from one ground receiver to the next while a caller is moving at 600 miles per hour. Because of the height at which planes fly, only 150 cell sites will be needed to provide coverage across the continental United States, according to Jack Blumenstein, AirCell's chief executive officer.

Because the AirCell system depends on towers on the ground, service would be limited to flights over land. In the test conducted by American Airlines, signals were sent first to satellites, and then to the ground. As satellites span the globe, cellphone calls using this system could theoretically be made while over water or other countries.

Cellphone signals in the American Airlines test, which was conducted by Qualcomm of San Diego, were first transmitted to a picocell in the cabin and then sent to a GlobalStar satellite. The GlobalStar system consists of 45 such satellites, which provide coverage everywhere except at the North and South Poles.

The signals were then sent from the satellite to one of three gateways in Texas and Canada. From there, each call was routed to the standard cellphone network for connection and billing.

The American Airlines test worked only with cellphones using the code division multiple access standard, or C.D.M.A. One advantage to that system is that C.D.M.A. phones use less power the closer they are to a cell site, reducing the chance of signal interference with the plane's navigation systems.

Scott Becker, general manager of Qualcomm's wireless systems division, said





a similar system could be designed for the standard called G.S.M., or global system for mobile communications. "While G.S.M. phones do not have power control, we do not think they would interfere with a plane's operation," he said.

While it has now been shown that cellular calls can be made safely from at least one aircraft, the F.A.A. wants to be convinced that such calls will never disrupt navigation on any plane, no matter who built it.

"Different manufacturers' airplanes have different amounts of wire shielding," said David Carson, a co-chairman of a committee charged by the F.A.A. with determining standards for in-flight cellphone use. "A plane's navigation system must be good enough to bring a plane in a fog bank within a few feet of the runway's center line," he said. "It is possible that cell use while landing will never be authorized."

Meanwhile, the airlines and the companies proposing technical solutions have only begun to wrestle with the technology's social implications. Various ideas to keep all passengers happy include restricting phone use to certain hours or to certain areas of the cabin. *And in a step back to the future, "I could see little glass booths in the back of the plane to talk in," Mr. Blumenstein said.*

In the end, cellphone courtesy will depend as much on the phone user as the rules in place. And based on initial anecdotal evidence, much work still needs to be done.

During the American Airlines test, "we told everyone that the softer you speak, the better the conversation," Mr. Ford said. "Yet the moment we gave out the cellphones, they all started yelling."

参考译文

2006年，国家商务专用大型客机可能会开始允许乘客在飞行过程中打电话和连接因特网了。乘客不用在飞机起飞前匆匆忙忙打完最后一个电话了。相反，他们将能够在飞行过程中用符合标准的移动电话打电话和接电话。

技术问题和社会问题仍然必须得到解决。航空公司、美国联邦航空局、联邦通讯委员必须确保手机将不会干扰航空飞行或通讯设备。讲电话的人和那些想要寻求一次安静的旅行的旅客之间会发生冲突，航空公司也必须设计一种方法来避免这种冲突。

当航空公司在等待政府的正式批准时，德航汉莎航空最近为因特网提供了国际航班

使用权。作为一个国外的航运公司，它不会受到联邦限制条件的影响。

美国航空高级副总裁蒙蒂·福特说："一个人群流动圈就能详细说明人们想要怎样工作怎样生活。"七月，航空公司进行了试飞测试，在飞机上乘客可以给全美国范围内的用户打电话，而且并不影响这架飞机的飞行。

"手机和手提式电脑可以在汽车和办公室里使用，但是却缺少在飞机上使用的功能，"福特先生说："但是，以一种正确的方式来使用这项技术是极其重要的。"

几年来，航运乘客一直都可以通过使用设置在坐椅背里面的电话在飞行中打电话。但是，高成本和低通讯效果使这种使用方法受到阻碍。

在飞机上使用手机可能会中断广播网络系统，也可能会干预飞机的航行定位系统，直到现在，人们还一直对这个问题感到忧虑。对地面通讯具有管辖权的美国联邦通信委员会，禁止在飞机飞行过程中使用手机，他们担心乘客从空中传播的电话信号会覆盖国家的超微型基站系统。根据美国联邦通信委员会代言人劳伦·帕特里克所说，该政策正在接受审查，并很有可能在今年10月份得到修改。

考虑到这一点，负责航班上通讯的美国联邦航空管理局建议航空公司禁止使用任何包括手机和携带式传呼器这样的能传输信号的设备，因它们都有干扰信号的危险。

AirCell系统能够处理三个正在被美国运营商C.D.M.A公司，T.D.M.A.公司或者G.S.M公司使用的数字电话标准。从每个电话里传出的信号由飞机的微微蜂窝天线接收，然后转化成一种数字信号，这个数字信号将会被传送到其中一个AirCell的地面接收器。为了降低成本，这些接收器可以位于由手机运营商所经营的接收器的附近。信号将会被分散并发送给客户的运营商，以用于确定路线和计费。

当来电者在以每小时600英里的速度移动时，这个体系被设计得能够在50,000英尺以外传输信号，并把它们从一个地面接收器传递到另一个。根据Aircell的首席执行官杰克布卢门施泰因所说，因为飞机飞行的高度，所以只需要150个网站来提供横跨美国大陆的涵盖范围。

因为Aircell系统要依靠地面传输基站，所以它的服务仅仅限于在地面上空飞行的航班使用。在美国航空公司所进行的测试中，信号首先被发往卫星，然后再传到地面。因为卫星跨越了整个地球，所以在理论上，使用此系统可以与跨越水域或其他国家进行手机通话。

美国航空公司的测试，是由高通公司的圣地亚哥指导的，在这个测试当中的手机信号首先传送至机舱内的微微蜂窝天线，然后发送给全球星卫星。全球星体系包括45个这样的卫星，这些卫星提供的覆盖范围包括除了北极和南极以外的任何一个地方。

然后卫星把信号传送给得克萨斯州和加拿大中的三个入口的其中之一。从那里开始，每次通话都被按规定路线发送到标准的手机网络，以用于连接和计费。

美国航空公司的测试只适用于使用区分码多址标准或CDMA的手机用户。那个体系的一个优点就是CDMA电话使用的能量越少，离网站的距离就越近，其对飞机导航系统信号干扰的可能性就越小。

高通公司的无线系统部的总经理斯科特·贝克尔说道，类似的体系可以设计为一个

叫做GSM那样的标准，或移动通信的全球系统。他说："当G.S.M电话没有能力控制的时候，我们认为他们并不会干扰一架飞机的操作。"

而现在已经表明，至少可以从一架飞机上安全地使用蜂窝式电话打电话。美国联邦航空管理局想要确信的是，不论是谁构建了它，这些电话都绝不会干扰任何飞机的导航。

同时，提出技术解决方案的航空公司和其他公司才开始思索技术的社会意义。各种能让所有乘客感到高兴的观点有：限制手机在某些时段或机舱的某些区域使用。

最后，手机使用方面的礼节将在很大的程度上取决于手机使用者本身，以及一个地方的规定。通过起初一些传闻证据显示，仍然还有许多工作需要做。

"在美国航空公司的测试当中，我们告诉了每一个人，说话的声音越轻柔，通话的效果就越好，"福特先生说："但是一旦我们把手机发给他们，他们都开始大声叫喊。"

核心词汇

cram [kræm] *vt.* 塞满，填满
cellular ['seljulə] *adj.* 手机的
yeller [jelə] *n.* 叫喊者
restriction [ris'trikʃən] *n.* 限制，约束
critically ['kritikəli] *adv.* 及其地，严重地
utilize [ju:'tilaiz] *vt.* 利用
disrupt [dis'rʌpt] *vt.* 使……分裂，使……瓦解
jurisdiction [ˌdʒuəris'dikʃən] *n.* 管辖权
interference [ˌintə'fiərəns] *n.* 冲突，干涉
terrestrial [ti'restriəl] *adj.* 地球的，地上的
billing ['biliŋ] *n.* 记账，编制账单
theoretically [θiə'retikəli] *adv.* 理论上
cabin ['kæbin] *n.* 机舱
gateway ['geitwei] *n.* 门，通路
division [di'viʒən] *n.* 公司，部门
convinced [kən'vinst] *adj.* 信服的，确信的
wrestle ['resl] *vi.* 摔跤，格斗
initial [i'niʃəl] *adv.* 开始的，最初的
anecdotal [ˌænek'dəutl] *adj.* 多逸事趣闻的，轶事一样的



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